

INNOVATION IN THE DESERT: 9TH AIR FORCE TACTICAL AVIATION LOGISTICS
IN NORTHWEST AFRICA DURING WORLD WAR II

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MASTER OF MILITARY ART AND SCIENCE
Art of War Scholars

by

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ABSTRACT

INNOVATION IN THE DESERT: 9TH AIR FORCE TACTICAL AVIATION LOGISTICS IN NORTHWEST AFRICA DURING WORLD WAR II, by Major Robert A. Nelson, 130 pages.

Despite the common aphorism that “amateurs talk about tactics, but professionals study logistics,” historians have largely overlooked the study of air logistics during World War II. This is especially true of tactical aviation logistics, particularly during the initial stages of the war. In an effort to alleviate the aforementioned oversight, this thesis will examine 9th Air Force (AF) tactical aviation logistics in the deserts of Northwest Africa using a learning organization lens. Beyond exposing the historical narrative, the learning organization methodology will unmask a prevalence for proactive change, resulting in an innovative culture which led to operational success. Furthermore, this thesis will expose the effect of pre-war culture and innovation, connecting 9th AF tactical aviation’s innovative change to interwar actions.

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TABLE OF CONTENTS

	Page
MASTER OF MILITARY ART AND SCIENCE THESIS APPROVAL PAGE	iii
ABSTRACT.....	iv
ACKNOWLEDGMENTS	v
TABLE OF CONTENTS.....	vi
ACRONYMS.....	viii
ILLUSTRATIONS	ix
TABLES	x
CHAPTER 1 INTRODUCTION	1
Learning Theory	12
Limitations	21
Conclusion	24
CHAPTER 2 INTERWAR YEARS	26
Historical Context of 9th AF Operations	26
USAAF before the war	26
USAAF in North Africa (1941-June 1942)	38
Conclusion	47
CHAPTER 3 UNITED STATES MIDDLE EAST AIR FORCE, JUNE–OCTOBER 1942.....	48
Situation on the Ground.....	49
DOTMLPF Logistical Struggles and Adaption	52
Doctrinal Starting Point	52
Logistics Shortfalls and Change	55
Conclusion	65
CHAPTER 4 9TH AIR FORCE AND THE DESERT AIR TASK FORCE’S DRIVE TO TUNISIA, OCTOBER–JUNE 1943.....	69
Situation on the Ground.....	69
DOTMLPF Logistical Struggles and Adaption	72
Doctrinal Starting Point	72
Logistics Shortfalls and Change	73

Conclusion	86
CHAPTER 5 CONCLUSION.....	89
Research Questions	89
What is a learning organization?.....	89
How does one examine a learning organization?.....	90
What effect did USAAF pre-war culture and initiatives have on the 9th AF?	92
What factors drove 9th AF change in Northwest Africa?.....	94
Was the 9th AF a reactive or proactive learning organization?.....	95
Applicability to Modern Operations: Adaptive Basing	97
Recommendations for Future Research.....	101
APPENDIX A LEND-LEASE FACILITIES AND NORTH AFRICA POPULATION CENTERS.....	103
APPENDIX B DOTMLPF ANALYSIS: SUPPLY LINES	104
APPENDIX C DOTMLPF ANALYSIS: TACTICAL AVIATION BEDDOWN/OPERATIONS	106
APPENDIX D DOTMLPF ANALYSIS: DESERT AIR TASK FORCE SUPPORT DURING THE RACE ACROSS NORTHWEST AFRICA.....	108
APPENDIX E OPERATION BUSTER AND THE DRIVE ACROSS NORTH AFRICA (REFERENCE SIGNPOSTS ON BOTTOM OF MAP).....	110
BIBLIOGRAPHY	111

ACRONYMS

AF	Air Force
ASC	Air Service Command
USAAF	United States Air Force
USAMEAF	Graduate Degree Programs

ILLUSTRATIONS

	Page
Figure 1. Relationships Between Theory and Theorists.....	13
Figure 2. 57th Fighter Group aboard USS Ranger	51
Figure 3. 9th AF Mobile Repair Team at an advanced American base in North Africa	78
Figure 4. A 9th AF convoy at a rest stop before continuing to moving to a new landing ground in North Africa	81
Figure 5. Mission brief in the Northwest African desert.....	86

TABLES

	Page
Table 1. Learning Organization Categories	20
Table 2. 66th Fighter Squadron Landing Grounds (LG) from November 1942–March 1943	79

CHAPTER 1

INTRODUCTION

In this brief review of the employment of Air Force, it must be clear that all of these purposes [air superiority and closing with the enemy] can be attained only when air power is used in tremendous quantities. In either the strategical or tactical field, it is the sustained and repeated attack that brings about the proper result. This conclusion leads, logistically, to another self-evident truth. The logistical treatment of a large force must be skillfully and intelligently handled or the chances of success are reduced to a bare minimum.¹

— Brigadier General Elmer E. Adler

The Ninth Air Force (9th AF) played a central role in the development of tactical aviation since its first days in the Northwest African desert. From its origins supporting the British Eighth Army during the El Alamein Campaign, the 9th AF's focus was tactical aviation.² Key to this focus was the ability to fight a highly mobile, forward-deployed battle against enemy forces. Unfortunately, United States Army Air Force (USAAF) logistics was not organized to meet this challenge.³

¹ Brigadier General Elmer E. Adler, was the Commanding General, Ninth Air Service Command; Elmer E. Adler, "Address to the Command and General Staff School, July 26, 1944," microfiche A1748, Air Force Historical Research Agency (AFHRA) Archives, Maxwell Air Force Base, AL.

² David E. Spaulding, "Early North African Campaigns 1940-1942: A Case Study" (Individual Study Project, United States Army War College, Carlisle Barracks, PA, 1992), 19, 75-82, accessed 20 April 2017, <http://www.dtic.mil/dtic/tr/fulltext/u2/a251441.pdf>.

³ Army Regulation 95-5, 20 June 1941, established the roles of Army Ground Forces, Army Service Forces, and Army Air Forces. Prior to this date, the Army Air Forces' role had been conducted by a combination of the Office of the Chief of Air Corps and General Headquarter, Air Force. Together, the aviation forces and subordinate units were commonly referred to as the Air Corps. After this date, the United States Army Air Corps provided a train, equip, and organize function and was subordinate to the United States Army Air Forces, led by General Henry "Hap" Arnold. For the purposes of this thesis, Army Air Forces will be used in place of United States Army Air Corps

One of the reasons for this lack of preparedness was the misalignment of tactical aviation with the USAAF's strategic focus. The USAAF focused primarily on General Giulio Douhet's ideas regarding airpower and the efficacy of strategic bombing. Douhet's theory of airpower rested on four principles. First, the inherent strength of the defense on land would result in static fronts. Airpower, on the other hand, would remain intrinsically offensive. As such, a nation's primary offensive thrust should be through the air. Second, the side that gains command of the air would have an uninterrupted ability to attack the enemy's vital centers. In Douhet's words, "a country in possession of adequate air forces can crush the material and moral resistance of the enemy; that is to say, that country can win regardless of any other circumstances whatsoever."⁴

The crux of Douhet's argument was "command of the air." Douhet defined command of the air as "the ability to fly against an enemy so as to injure him, while he has been deprived of the power to do likewise."⁵ Bombers were the key to commanding the air. Douhet envisioned the destruction of both the enemy's airpower and economic capability to produce airpower through strategic bombing.⁶ While admitting the need for

throughout. James L. Cate and Wesley F. Craven, "The Army Air Arm Between Two Wars, 1919-39," in *The Army Air Forces in World War II, Vol I*, eds. Wesley F Craven and James L. Cate (Chicago: University of Chicago Press, 1955), 115; Chase C. Mooney and Edward C. Williamson, USAF Historical Studies No. 10, *Organization of the Army Air Arm* (Maxwell AFB, AL: Air University, 1956), 3-7, accessed 20 April 2017, <http://www.afhra.af.mil/Portals/16/documents/Studies/1-50/AFD-090602-034.pdf>.

⁴ Giuliano Douhet, "The Command of the Air," trans Dino Ferrari, in *Roots of Strategy, Book 4*, ed. David Jablonsky (Mechanicsburg, PA: Stackpole Books, 1999), 340.

⁵ Ibid., 341-2.

⁶ Ibid., 340-444.

fighter aircraft, Douhet believed that fighters were vulnerable to bombing and that their effectiveness after the initial stages of battle was minimal in a short, brutal bombing war.⁷

Finally, Douhet declared the command of the air impossible without a unified air service. Unified command guarded against “any effort, any action, any resources diverted from this essential action (command of air)” which Douhet claims “makes defeat in case of war that much more probable.”⁸ His admonitions against diversion of resources specifically disparaged direct support to the Army or Navy.

America’s isolationist foreign policy exacerbated the USAAF’s single-minded concentration on Douhetian strategic bombing. Prior to 1940, there was a prevailing belief that America did not need to involve itself in international affairs to maintain its security. In the words of California Senator Hiram Johnson, “the argument that if we do not help to stop Hitler now, he will conquer Europe and we will be next is a perfectly idiotic assumption.”⁹ Johnson also argued, “God gave us two great oceans, so that the threat from the Far East, like the threat from Europe, contained no acute peril for the United States.”¹⁰ The United States’ shift away from isolationism accelerated with the

⁷ Bernard Brodie, “Some Notes on the Evolution of Air Doctrine,” *World Politics*, 7, no. 3 (April 1955): 349-51, 360-362, accessed 22 April 2017, <http://www.jstor.org/stable/2008997>; E. Kathleen Williams, “Air War, 1939-41,” in *The Army Air Forces in World War II, Vol I*, eds. Wesley F Craven and James L. Cate (Chicago: University of Chicago Press, 1955), 82-3.

⁸ Douhet, 339.

⁹ Hiram Johnson of California, speaking on the Neutrality Act on 20 October 1939 Cong. Rec., 76 Cong., 2, Sess., 1939, Vol 85, 631.

¹⁰ Hiram Johnson of California, speaking on 16 January 1935, Cong. Rec., 74th Cong., 1st Sess., 1935, vol 79, 498.

success of the German *blitzkrieg* and the fall of France in 1940.¹¹ Isolationism, however, does not imply a lack of American involvement in the larger world. After all, the United States was a global economic power with global business interests. This led some historians to classify the 1930s as a non-interventionist rather than isolationist period.¹² The business ties and economic interests were important USAAF logistical factors, providing an initial experience base for both the Lend-Lease program and the 9th AF as it stood up in North Africa in 1942.¹³

The USAAF's adherence to strategic bombing and America's non-interventionist policy shaped the War Department's air doctrine, spawning the concept of strategic defense.¹⁴ Strategic defense consisted of well-defended coastal bases along the exterior of the country from which the USAAF could strike against any threat to the United States'

¹¹ Peter G. Boyle, "The Roots of Isolation: A Case Study," *Journal of American Studies* 6, no. 1 (April 1972): 42-3, accessed 23 April 2017, <http://www.jstor.org/stable/27552971>.

¹² Wayne S. Cole, "American Entry into World War II: A Historiographical Appraisal," *The Mississippi Valley Historical Review* 43, no. 4 (March 1957): 595-617, accessed 23 April 2017, <http://www.jstor.org/stable/1902275>.

¹³ Aircraft corporations had established relationships with friendly powers through the mid-1930's as those same powers began building up for war. These relationships provided funding and incentives for manufacturers to upgrade existing aircraft and produce new aircraft. For instance, the A-20 was a result of French spending - the USAAF were not involved initially. These relationships proved invaluable when Lend-Lease providing the funding to produce even greater numbers of aircraft. Chapter 3 of this paper will discuss the interrelation of aircraft corporations and North African logistical infrastructure. Geoffrey Perret, *Winged Victory*; (New York: Random House, 1993), 92-102, 118-120; Eugene Staley, "The Economic Implication of Lend-Lease," *The American Economic Review* 33, no. 1 (March 1943): 362-3, accessed 3 May 2017 <http://www.jstor.org/stable/1819022>.

¹⁴ Brigadier General E. E. Addler, Letter to Brigadier General Henry Miller, 3-Oct-1941, AFHRA Archives, Maxwell AFB, AL.

security. Following Douhet's example of fighters as an ancillary force, they would escort bombers to and from the target area. Rather than fighter escorts, strategic bombing adherents believed bombers' defensive armament would form impenetrable defensive barriers—leading to the B-17's "Flying Fortress" designation.¹⁵ The unification of basing structure and mission profile within continental United States favored a centralized support structure, where logistical support was consolidated at large stable bases directly attached to national means.

Strategic defense directly contradicted the logistical realities of tactical aviation. Strategic defense was predicated on static bases, long-standing intra-service support agreements, and entrenched lines of communication. Tactical aviation, on the other hand, required mobile, temporary bases, flexible and responsive support, and constantly shifting lines of communication. Tactical aviation's requirements stemmed from a highly mobile air effort that focused on air interdiction missions and utilized fighters in the role of fighter-bombers, which required aviation assets to relocate along the front lines to ensure tactical reach. In summary, logistical requirements for strategic defense were ill-suited to tactical aviation.

The evolution of 9th AF logistics also had to meet the challenge of an explosive growth in aircraft and personnel.¹⁶ What began as a relatively small two-squadron task

¹⁵ Alfred Goldberg, "AAF Aircraft of World War II," in *The Army Air Forces in World War II, Vol VI*, eds. Wesley F Craven and James L. Cate (Chicago: University of Chicago Press, 1955), 202-7.

¹⁶ Edith Rogers, USAF Historical Studies No. 108, *The USAAF in the Middle East: A Study of the Origins of the Ninth Air Force* (Maxwell AFB, AL: Historical Division, 1945), 19-22, accessed 23 April 2017, <http://www.afhra.af.mil/Portals/16/documents/Studies/101-150/AFD-090522-044.pdf>.

force and 550 personnel would eventually reflag as the 9th AF and grow to over 14,000 Airmen by early 1943.¹⁷ On the materiel side, the 9th AF initially boasted 41 aircraft, which would exceed 900 by 1943.¹⁸ The growth in personnel was mirrored by the critical role 9th AF played in supporting Army ground offenses throughout Northwest Africa. This period also saw the role of 9th AF logistics evolve from a small corps of under-resourced and untried warriors to “one of the hottest, best organized, most strictly on-the-ball outfits that war has ever seen.”¹⁹

How then did the 9th AF, and specifically its logistics infrastructure, cope with the learning curve? This thesis examines the growth and transformation of 9th AF logistics during World War II. There is little doubt that the 9th AF was a learning organization. The brutal Darwinism of war and the changing organizational aspects of the 9th AF provide ample evidence that some learning did occur. Less obvious is whether 9th AF logistics adapted only when challenges arose or if they were a truly proactive

¹⁷ Harry C. Coles, USAF Historical Studies No. 30, *Ninth Air Force in the Western Desert Campaign to 23 January 1943* (Maxwell AFB, AL: Historical Division, 1945), 122, accessed 23 April 2017, <http://www.afhra.af.mil/Portals/16/documents/Studies/1-50/AFD-090602-067.pdf>.

¹⁸ Edith Rogers, 168; John R. Reese, “Halpro: the Halverson Detachment in the Middle East June-July 1942,” *Air Power History* 57, no. 2 (Summer 2010): 32-33, accessed 3 May 2017 <http://lumen.cgsccarl.com/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=52417300&site=ehost-live&scope=site>; Lewis H. Brereton, *The Brereton Diaries: The War in the Air in the Pacific, Middle East and Europe* (New York: William Morrow and Company, 1946), 298.

¹⁹ Seargent Fred Johnson, IX Air Service Command in an interview with Combat Journalist Master Sergeant George V. McNally, in *Ninth Air Force Service Command*, eds. Margretta C. Lasch and Eleanor M. Heins (Philadelphia, PA: The Beck Engraving Co, 1945), 59.

organization, forecasting future challenges and rising to meet those challenges before change was forced on them? Using case studies, this paper will address whether 9th AF logistics was a reactive or proactive learning organization. Of course, this begs yet more questions. What is a learning organization and how does one examine it?²⁰ What effect did USAAF culture and pre-war initiatives have on the 9th AF? Finally, what factors drove the 9th AF's changes, be they reactive or proactive?

Moreover, what lessons do an evaluation of 9th AF tactical aviation logistics in Northwest Africa have to tell modern strategists about today's challenges? With the rise of near-peer threats and adversaries increasing ability to threaten established airfields, how can the United States Air Force (USAF) continue to "project purposeful action for the joint force?"²¹ What lessons can modern strategists take from the 9th AF's hard-earned lessons in tactical aviation logistics on a mobile, contested battlefield?

²⁰ Aimee Fox-Goddard, "Beyond the Western Front," *War in History* 23, no. 2 (2016): 191-4, accessed 3 May 2017 <http://lumen.cgsccarl.com/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=113832324&site=ehost-live&scope=site>; Robert T. Foley, "Dumb Donkeys or Cunning Foxes? Learning in the British and German Armies during the Great War," *International Affairs* 90, no. 2 (March 2014): 279-98, accessed 3 May 2017, <http://lumen.cgsccarl.com/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=94914644&site=ehost-live&scope=site>; C. Marlene Fiol and Marjorie A. Lyles, "Organizational Learning," *Academy of Management Review* 10, no. 4 (1985): 804, accessed 3 May 2017 <http://lumen.cgsccarl.com/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=4279103&site=ehost-live&scope=site>; Michel Goya, *La Chair et l'acier: L'armée française et l'invention de la guerre modern*, translated by author (Paris: Tallandier, 2004), 17-28.

²¹ Mark Svestka, interview by author, Pentagon, Washington, DC, 11 April 2017. Mark Svestka is a Senior Policy Analyst with Headquarters Air Force, A5X "Skunkworks," working on the concept of Adaptive Basing.

This cross-examination of changes is founded in a systemic evaluation of 9th AF logistics. While not in use in 1941, the modern military framework of Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF) provides a holistic evaluation tool. Designed as a conceptual model to analyze capability gaps, DOTMLPF uses a systems framework to evaluate issues from multiple points of view. Rather than view problems through the soda straw of a particular element (such as training or leadership), a DOTMLPF approach examines issues through the competing lenses of doctrine, organization, training, etc. Furthermore, a DOTMLPF approach looks at interdependent factors within the framework, such as facility issues that impede training. Another example would be doctrine that emphasizes ground operations, leading to an emphasis on ground versus air maintenance facilities which subsequently causes substandard training in aircraft maintenance. While the capability gap is aircraft maintenance training, a thorough DOTMLPF review identifies the multiple factors (doctrine, facilities, and training) involved. The same multifaceted capability evaluation is then utilized to solve inter-connected problems.²²

Although all aspects of DOTMLPF have value, this thesis will concentrate on the aspects of doctrine, organization, materials, and facilities. A limited viewpoint is not intended to exclude other aspects, but to emphasize the integrated systems framework of DOTMLPF. For instance, an organization can shape both personnel assignments and the

²² Joint Chiefs of Staff, Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3010.02E, *Guidance for Developing and Implementing Joint Concepts* (Washington, DC: Government Printing Office, 17 August 2016), A3-5, accessed 23 April 2017, <http://www.jcs.mil/Portals/36/Documents/Library/Instructions/CJCSI%203010.02E.pdf?ver=2017-02-08-173223-657>.

required training. Likewise, doctrine shapes organizational, materiel, and facility resource availability and requirements. In short, concentrating on certain aspects is less an exclusion of others than a choosing a specific lens.

Doctrine exemplifies interlocked nature of DOTMLPF, as it provides a common language and understanding for the employment of all other aspects.²³ The authoritative doctrinal source from 1939-1944 was the War Department; however, doctrine was not confined to this level-the USAAF also promulgated its own doctrine. Doctrine differs from procedures in that it is not prescriptive. Procedures outline the necessary steps to accomplish a task, while doctrine outlines standard methods for employing military forces to achieve objectives. Once doctrine has established how forces are employed, the next step is organizing those forces.

The organizational element of DOTMLPF explores how forces are structured to fight. The organizational element combines doctrinal requirements with available means to provide a structure that supports the forces' operational mission. At the same time, organization is not limited to operational units. The process culminates at the warfighter, but extends back to encompass both logistical and headquarters relationships. Additionally, organizational constructs drive other DOTMLPF elements, shaping everything from training to facilities.

Training provides the skills organizations need to accomplish their mission. This occurs in two separate manners. First, training embraces cradle to grave concepts. It begins when recruits are accessed into the Armed Forces and continues through

²³ Ibid., A-3.

supervised instruction during operations. Second, training is a determining factor in organizational and leadership requirements, specifying the need for organized instruction-even instructional units-or leadership requirements for apprenticeship-style training. Similar to training, the material aspect of DOTMLPF equips organizations so they can accomplish their objectives.

Materiel encompasses what organizations are trained to use. Materiel requirements extend from major weapon system acquisitions to common bench stock supplies. Just as importantly, the material aspect of DOTMLPF can imply “materiel approaches for a capability solution.”²⁴ A materiel solution is where things, versus people or processes, are the primary problem-solving means. In other words, organizations change what they fight with vice who or how they fight. Of course, this concept is relative, as new equipment often requires changes in organizational structure, training, and personnel allocations.

Similar to how materiel solutions can influence other aspects, the leadership and education aspect of DOTMLPF is closely related to personnel and training. On an individual unit level, leadership typifies the thought patterns and decision trends of an organization’s commanding officer. At the same time, professional military education is a vehicle for leadership and education to influence a generation of leader’s thoughts and capabilities. In the case of the USAAF, the Army Command and General Staff College and the Air Corps Tactical School (ACTS) filled this role. Moreover, the unit’s organizational structure can affect leadership influence. For the purposes of this thesis,

²⁴ Ibid., A-4.

leadership and education refers to the qualities of commanding officers that influence mission accomplishment.

Unlike the somewhat vague and personality-dependent leadership aspect of DOTMLPF, personnel refers to the people who “accomplish assigned missions, tasks and activities.”²⁵ Basically, the personnel aspect of DOTMLP addresses how organizations are manned. This aspect uses manpower to address capability gaps by placing the right people in the right units and in sufficient quantities. It is highly dependent on materiel requirements, organization, training, and facilities.

Facilities is another unambiguous aspect of DOTMLPF. It includes not only unit facilities, but also requirements related to “deployment, reception, staging, movement, and sustainment.”²⁶ This rather all-encompassing statement can refer to everything from ports facilities to supply and maintenance depots. Due to the limited scope of this thesis, facilities do not include the defense industrial base, such as armaments, warplane factories, and debarkation ports within the continental United States.

The manner in which 9th Air Force logistics organizations deal with DOTMLPF capability gaps provides the foundation for an examination of the learning culture. DOTMLPF identifies what went wrong, as well as what was done to fix it. Learning theory then applies a scientific lens to ascertain how it was fixed. For instance, was the process “ad hoc,” as British military scholar and Kings College lecturer Dr. Aimee Fox-Godden labeled reactive, adaptive learning, or was it a systemic process that nurtured and

²⁵ Ibid., A-5

²⁶ Ibid.

developed generative, proactive change?²⁷ The variance spells the difference between an organization constantly reacting to catastrophe and one that proactively molds itself to avoid catastrophe. Of course, one must keep in mind that an adaptive organization is not necessarily an unsuccessful organization, nor does it imply that adaptation or innovation are exclusive. In a wartime environment, the enemy has a vote and units must adapt to the enemy's influence. What it does suggest is that a proactive, innovative unit is better prepared to succeed.

Learning Theory

This thesis leverages multiple learning theories taken from both corporate and military-focused literature. These theories are merged, combining elements of adaptive and innovative organizations into the unified learning theory used as a working definition throughout this paper. This theory attempts to delineate between the key concepts of reactive and proactive learning as applied to adaptive and generative organizations. These concepts are then overlaid against wartime organizations ability to step back from the fight and apply changes.

²⁷ Fox-Goddard, 194.

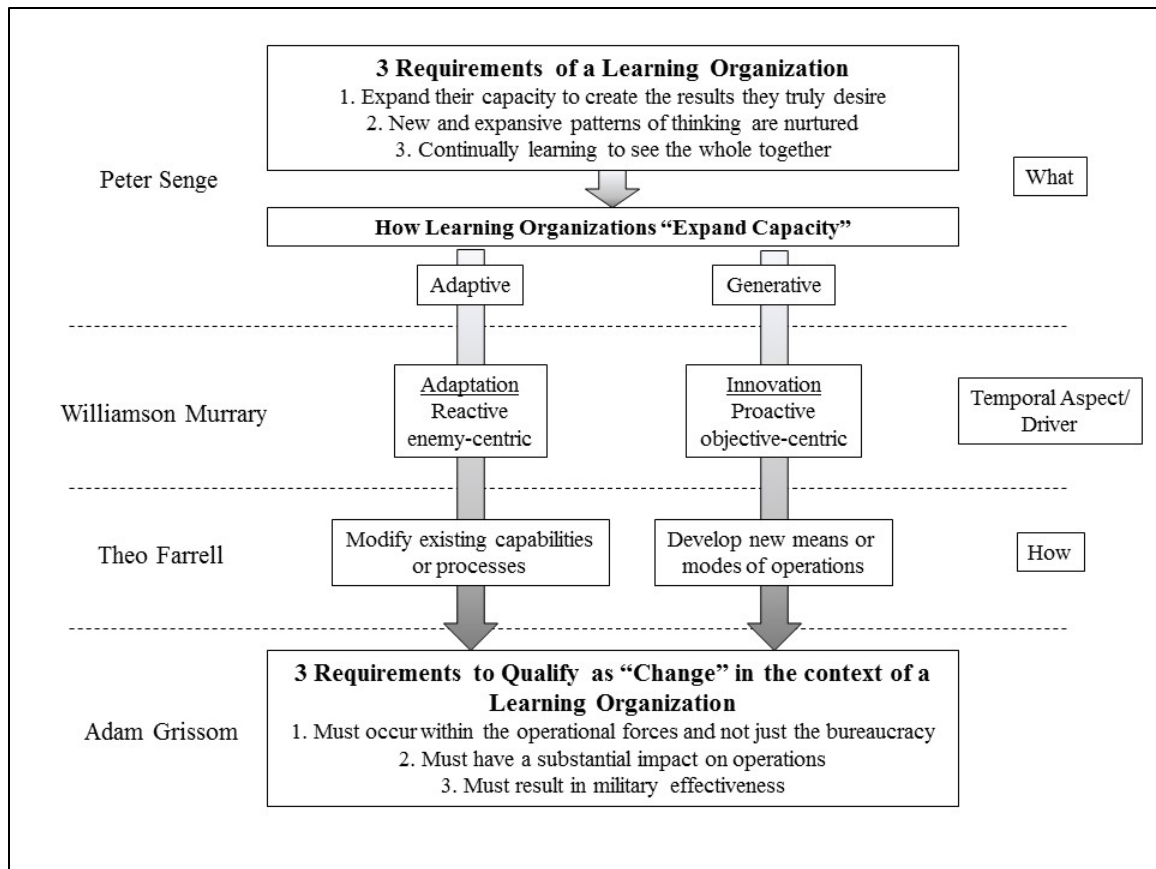


Figure 1. Relationships Between Theory and Theorists

Source: Created by author.

The use of learning theory in general, and specifically within this thesis, owes much of its current relevance to Harvard Business Professor Peter Senge. His book, *The Fifth Discipline: The Art and Practice of The Learning Organization* defines a learning organization as “organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see

the whole together.”²⁸ The aspirational nature of the aforementioned definition may seem juxtaposed against a wartime unit, but is actually quite fitting.

Indeed, it is the duty and responsibility of a unit at war to “expand their capacity to create the results they truly desire.”²⁹ This idea embraces the DOTMLPF construct by examining current capabilities against required capabilities to achieve operational results. Likewise, doing so may require “new and expansive patterns of thinking.”³⁰ Senge warns that looking at problems in new and creative ways can be difficult, especially in organizations with strong cultural identities. Though Senge provides this warning in the context of business, his references to the conformist and change-resistant nature of corporate culture are echoed in the conservatism of military culture.³¹ Both views discourage wholesale change and the attendant disruption. Yet, given a constrained capability set, the only way to eliminate the shortfall may be through a new methodology.

²⁸ Peter Senge, *The Fifth Discipline: The Art and Practice of The Learning Organization* (New York: Doubleday, 1990), 3.

²⁹ Ibid.

³⁰ Ibid.

³¹ Senge, 13-4, 144-5; Samuel P. Huntington, *The Soldier and the State* (Cambridge, MA: Harvard University Press, 1957), 143-62; Carl H. Builder, *The Masks of War: American Military Styles in Strategy and Analysis* (Baltimore, MD: John Hopkins University Press, 1989), 38-40. Interestingly, recent research shows that senior military leaders are still more conservative than the general public (or even junior officer), suggesting that the military values conservative over non-conservative attitudes; Rosa Brooks, “Civil-Military Paradoxes,” in *Warriors and Citizens: American Views of Our Military*, eds. Kori Schake and Jim Mattis (Stanford, CA: Hoover Institution Press, 2016), 58-61.

Not all learning organizations “expand capacity” in the same way.³² Senge argues that there are “adaptive” and “generative” learning organizations.³³ Adaptive organizations are reactive. Sometimes called catastrophic learning, they adapt in response to urgent stimuli that prevents them from meeting their immediate requirements. Generative learning is proactive. Rather than responding to problems, generative learning effects organizational change to improve operations without an immediate trigger. In short, an urgent crisis is not required to spur change. Generative organizations also attempt to apply change in a more holistic manner across the organization. Doing so embraces the idea of a learning organization “where people are continually learning to see the whole together.”³⁴ In a DOTMLPF context, a generative organization attempts to find solutions that bridge multiple factors and employ second and third order effects to mitigate forecasted capability gaps.

It is important to note that generative learning’s focus on future and holistic effects does not imply those organizations are incapable of responding to urgent crises. Most generative organizations are also adaptive. While able, they are not restricted to a reactive methodology. In fact, one common example of generative learning is when an organization applies adaptive change in one area to other, seemingly non-connected, areas to enhance capacity.³⁵

³² Senge, 3.

³³ Ibid., 13-4.

³⁴ Ibid., 3

³⁵ Ibid, 13-4.

Most military learning organizations meet Senge's adaptive definition. To a large degree, this is because military organizations tend to be culturally conservative.³⁶ Even the USAAF, whose long-standing fight against the Army power structure and technological tendencies tended to alleviate the conservative restrictions inherent in Senge's learning model, was more likely to modify processes in reaction to problems than in anticipation of them.³⁷ In part, this was because of the conservative ground force factions within the Army; however, the USAAF also exhibited the groupthink and the failure to communicate a unified vision characteristic of large organizations.³⁸

The difference between adaptive and generative change is also influenced by context. Williamson Murray, Ohio State Professor Emeritus of History and Strategic Studies Initiative adjunct professor, argues that the character of learning is dependent upon whether a nation is at war. Broadly mirroring the concepts of adaptive and generative change, Murray posits that adaptive change is endemic in wartime where

³⁶ Huntington, 143-162; Builder, 38-40.

³⁷ Constant change within the Army Air Service, Army Air Corps, and USAAF highlighted the struggle between the USAAF and Army Ground Forces, as well as a willingness to change, Chase C. Mooney and Edward C. Williamson, 1-6; Cate and Craven, "The Army Air Arm Between Two Wars, 1919-39," 47-53.

³⁸ Senge, 212-8; John P. Kotter, *Leading Change* (Boston, MA: Harvard University Press, 1996), 78-82; Group think was demonstrated by the adherence to Strategic Bombing which will be discussed later in this thesis, while the failure to communicate a unified vision can be seen in the multiple conflicting views on the command structure of the USAAF throughout the late 1930's as well as the obvious tensions between Air Material Command and IX Air Service Command in 1942, Elmer E. Adler, "Letter from Brigadier General Elmer E. Adler to Brigadier General Henry Miller," 3 Sept 1941, Microfiche A1748, AFHRA Archives; Elmer E. Adler, "Letter from Brigadier General Elmer E. Adler to Brigadier General Clements MacMullen," 21 Sept 1942, *Personal Collection of Elmer E. Adler*, Folder 13, AFHRA Archives.

one's forces are constantly reacting to the enemy, while innovative change can only occur in peacetime when the necessities of war are not present.³⁹

The constant pressure of enemy reaction characterizes Murray's definitions of adaptation and innovation, but they are anchored by the concepts of feedback and immediacy. Echoing the immediate nature of Senge's adaptive change, Murray argues that adaptation is characterized by limited time and the constant feedback of combat. Furthermore, enemy action not only provides a limited window to adapt, but drives a constant stream of adaptation. After all, adaptation is not limited to friendly forces, but must also take into account enemy counter-adaptation. Innovation, on the other hand, is characterized by the time to think through problems and the lack of an "interactive, adaptive opponent."⁴⁰ This lack of an immediate trigger fits with the proactive nature of generative change.

The careful application of Senge's adaptive/generative learning theory expands Murray's definitions of adaptation and innovation beyond an entirely wartime environment. Basically, adaptation is adaptive, reactive learning. Conversely, innovation is generative, proactive learning. The key is who or what is driving immediate change. For instance, while the enemy is always a factor in a wartime environment, they do not always demand immediate change. Wartime innovation occurs when organizations' time limitations are self, versus enemy, imposed and driven by internal timelines. Moreover,

³⁹ Williamson Murray, "The Interwar Years" (CGSC Art of War Scholars Lecture, 25 January 2017).

⁴⁰ Williamson Murray, *Military Adaptation in War: With Fear of Change* (New York: Cambridge University Press, 2011), 2-3, 309-10.

innovation attempts to address a future, envisioned challenge, while adaptation addresses an immediate, concrete problem.

In “Improving in War,” Theo Farrell, Head of the Department of War Studies at Kings College, London and Chair of the British International Studies Association, moves beyond how change is defined and attempts to explain just how military organizations practice it. First, military organizations “exploit core competencies in refining or modifying existing tactics, techniques and/or technologies.”⁴¹ This type of change tends towards the immediate, customizing known competencies and capabilities to overcome an immediate threat. The immediate nature of the threat and minimal requirement for change within the organization tends to align “refining or modifying existing” processes with the reactive nature of Senge’s adaptive learning and Murray’s adaptation.⁴² Farrell’s other definition of military change is to “explore new capacities by developing new modes and means of operations,” taking a longer and more holistic approach.⁴³ The comprehensive nature and forward-looking nature of “explor[ing] new capacities” is affiliated with Senge’s generative approach, or Murray’s innovation.⁴⁴ Of course, change in and of itself does not create an adaptive organization. An organization that updates its

⁴¹ Theo Farrell, “Improving in War: Military Adaptation and the British in Helmand Province, Afghanistan, 2006-2009,” *The Journal of Strategic Studies* 33, no. 4 (August 2010): 570, accessed 23 April 2017 <http://www-tandfonline-com.lumen.cgsccarl.com/doi/full/10.1080/01402390.2010.489712>.

⁴² *Ibid.*, 570.

⁴³ *Ibid.*

⁴⁴ *Ibid.*

record keeping processes or implements new, less effective means of fighting battles has changed, but does it classify as an adaptive organization?

Senior RAND researcher Adam Grissom argues that military adaptation, or innovation, must demonstrate three key characteristics to move beyond mere change. First, change must occur within the operational forces and not just the bureaucracy. Second, change must have a substantial impact on operations. Finally, change must result in military effectiveness. Effectiveness is the key to Grissom's theory.⁴⁵ The first two criteria can hold through a military disaster or bungling, while change in a learning organization is inherently concerned with improving operations.⁴⁶ English military historian and author Corelli Barnett summarizes this concept as "a change in operational praxis that produces a significant increase in military effectiveness."⁴⁷

This thesis combines these definitions of adaptation and innovation to create a unified learning theory. Adaptive change, also called catastrophic change (though it does not necessarily require a catastrophic threat), is a direct result of enemy action. It is a reaction to unanticipated conditions of war and takes place as immediate, enemy-imposed

⁴⁵ In the context of this thesis, military effectiveness applies primarily to effectiveness at the tactical level of operations. In limited cases, it may support the operational level, such as the ability of logistics to anticipate and support operational objectives. In this case, the ability to support the operational level of war is evaluated, though primarily through the lens of tactical tasks. For a more in-depth look at the various aspects of military effectiveness, see Williamson Murray, *War, Strategy, and Military Effectiveness* (New York: Cambridge University Press, 2011).

⁴⁶ Adam Grissom, "The Future of Military Innovation Studies," *The Journal of Strategic Studies* 29, no. 5 (2006): 907, accessed 23 April 2017 <http://www.tandfonline.com.lumen.cgsccarl.com/doi/full/10.1080/01402390600901067>.

⁴⁷ Corelli Barnett, *The Swordbearers: Studies in Supreme Command in the First World War* (London: Eyre and Spottiswoode, 1963), 11.

pressures present themselves, using resources largely at hand. Feedback is equally immediate, flowing from operational effectiveness and the enemy's reaction. This feedback also creates a reinforcing loop where enemy reaction prompts adaptive counter-reaction, generating constant adaptation. Finally, as the goal of adaptive change is to stay a step ahead of the enemy, it generally results in limited change across some, but by no means all, of DOTMLPF's aspects.

Conversely, innovative change is proactive and is not spurred by immediate pressures. Innovation utilizes an evaluation of past events to provide a generative, cross-DOTMLPF solutions to future problems. This cross-DOTMLPF solution may incorporate additional resources or new material solutions, given the luxury of time. Feedback flows from self-imposed tests and evaluations based on one's perception of the future threat, rather than the real-world crucible of enemy action. As a result, innovation is an incomplete answer that often requires some adaption upon contact with the enemy.

Table 1. Learning Organization Categories	
Adaptive	Innovative
Reactionary	Proactive
Confined to part of the organization	Spread across the organization
Limited DOTMLPF solution	Utilizes all applicable DOTMLPF elements
Primarily uses available resources	May incorporate new resources
Time limited by adversary	Time limits self-imposed

Source: Created by author.

Limitations

This thesis is bounded by a number of limitations, split between historical concerns immediately preceding and during World War II and modern concerns applicable to the modern concept of adaptive basing. Historical concerns primarily revolve around the limitations of source materials and scope.

In the case of sources, the majority of secondary source materials for this topic are from either United States Army Air Force historical studies or Wesley Craven and James Cates seven-volume series, *The Army Air Forces in World War II*. In both cases, these sources were written immediately after the war and incorporate institutional biases in favor of strategic bombing and, in a related form, the USAAF's attempt to split into a separate Air Force. The USAAF's preoccupation towards strategic bombing tended to limit the information available on tactical aviation. Furthermore, what information was available focused on air operation, to the point that even the most recent scholarship has little information on the tactical aviation logistics prior to the 9th Air Forces invasion of Sicily in June 1943.⁴⁸ An outgrowth of strategic bombing was a widespread belief that the USAAF should become a separate service. The USAAF was convinced a unified and untethered chain of command was key to the strategic implementation of airpower.⁴⁹ This belief resulted in a tendency to highlight intra-service issues to better justify the need for

⁴⁸ Christopher M. Rein, *The North African Air Campaign: U.S. Army Air Forces from Al Alamein to Salerno* (Lawrence, KS: University Press of Kansas, 2012); Robert Ehlers, *The Mediterranean Air War: Airpower and Allied Victory in World War II* (Lawrence, KS: University Press of Kansas, 2015).

⁴⁹ Mooney and Williamson, 8, 29; Cate and Craven, "The Army Air Arm Between Two Wars, 1919-39," 25-32.

a separate Air Force service. While objective statistics and first-person accounts underscored the official histories, these cultural norms and beliefs must be taken into account.

Second, this thesis employs firm temporal bounds. The state of the USAAF prior to World War II is provided for contextual purposes, but not evaluated. The assessment of 9th AF logistics as a learning organization rests entirely on the USAAF actions in Northwest Africa from 1941 to June 1942 and the 9th AF's behavior through June 1943. In an operational context, this paper will examine actions in support of the initial build up in Northwest Africa and the subsequent drive to Tunisia.

Additionally, this thesis is limited in scope to logistics in support of tactical airpower. The 21 July 1943 version of FM 100-20, *Command and Employment of Air Power*, defines tactical airpower as:

The mission of the tactical air force consists of three phases of operation in the following order of priority:

(1) *First priority*--To gain the necessary degree of air superiority. This will be accomplished by attacks against aircraft in the air and on the ground, and against those enemy installations which he requires for the application of air power.

(2) *Second Priority*--To prevent the movement of hostile troops and supplies into the theater of operations or within the theater.

(3) *Third priority*--To participate in a combined effort of the air and ground forces, in the battle area, to gain objectives on the immediate front of the ground forces.⁵⁰

These limitations specifically exclude strategic bombing in favor of the pursuit and attack aviation aspects of airpower.

⁵⁰ War Department, Field Manual 100-20, *Command and Employment of Air Power*, 21 July 1943 (Washington, DC: Government Printing Office, 1944), 10-11.

The majority of logistics in tactical aviation is concerned with supporting the pursuit and attack aviation missions. Composed of fighter and interceptor aircraft, pursuit aviation's goal was to destroy the enemy in air-to-air combat. Prior to the war, operational reach generally confined this role to the friendly territory or the forward line of contact, assuming airfields were close enough to the front to support this role. The tactical airpower employment of pursuit differs sharply from its strategic role, which was primarily concerned through 1944 with bomber escort.⁵¹ Attack aviation comprises the second half of tactical airpower, concentrating on the delivery of firepower to enemy forces. It is differentiated from strategic bombing by its target, which is in support of ground forces at the operational level rather than strategic-level targeting separated from ground forces immediate concerns.⁵² These differences drive divergent logistical requirements, especially in regards to mobility, shortened turn-times, and airfield exposure to the enemy.

Additionally, though photo reconnaissance, observation, and transport aircraft have a distinct role within tactical airpower, this thesis is primarily concerned with logistical support for the combat air forces. This is not to denigrate the importance of

⁵¹ Bomber escorts, which were normally kept in close to the bombers were directed to break and pursue fighters, capping a concerted effort to destroy German Air Force fighter aircraft capability, Arthur B. Ferguson, "Big Week," in *The Army Air Forces in World War II, Vol III* eds. Wesley F Craven and James L. Cate (Chicago: University of Chicago Press, 1955), 47-8.

⁵² Thomas H. Greer, USAF Historical Studies No. 89, *The Development of Air Doctrine in the Army Air Arm, 1917-1941* (Washington, DC: Air University, 1953), 36, 39, accessed 23 April 2017, <https://books.google.com/books?id=sRZgQ5VAVzkC&lpg=PA149&ots=8Q-n-kATe-&dq=%22Development+of+Air+Doctrine+in+the+Army+Air+Arm+1917-1941%22&pg=PP1&hl=en#v=onepage&q&f=false>.

these roles; however, the limited scope of this thesis does not permit an examination of logistical support specific to additional mission sets. One caveat to this limitation is the integral role transport aircraft play as part of the logistics supply chain.

In addition to the temporal and mission limitations, this thesis is also limited to actions central to the conduct of 9th AF logistics. While this seems obvious at first glance, one must remember that the United States government, the United States Army, and the USAAF were going through a period of great change. For example, one could argue that classification changes during military accessions and limitations on labor deferments played a crucial role in the employment of tactical aviation; however, to do so would exceed the goals of this paper.⁵³ To solve this dilemma, this thesis will only examine factors directly relating to logistical support for 9th AF tactical aviation. Where actions outside the 9th AF are relevant, a clear chain of events to the front lines will be delineated. In this way, actions by the USAAF before the war, in particular those in the Middle East from 1941 to June 1942, will be connected to the overarching concerns of how the 9th AF changed.

Conclusion

As evidenced by the lack of secondary research on logistics in Northwest Africa, the support efforts that enable operations is often underappreciated. Underappreciated is not, however, the same as irrelevant. Carl von Clausewitz warns modern strategists, “War

⁵³ Ted Wilson, “Total War: World War II Planning, Mobilization and War Termination Objectives” (CGSC Art of War Scholars Lecture, Hall of Humanities, University of Kansas, 30 January 2017). Dr. Wilson is Professor Emeritus, University of Kansas History Department.

is more than a mere chameleon that slightly adapts its characteristics to the given case.”⁵⁴

The actors, the technology, the *characteristics* of war may change, but the nature of war is enduring. The logistical challenges of maintaining mobility and operational reach in a contested environment remain despite almost 80 years’ separation.

This thesis will utilize a DOTMLPF-based examination of the transitory characteristics of the 9th AF’s tactical aviation campaign in Northwest Africa. This examination will establish that despite capability gaps throughout the tactical aviation logistics enterprise, the 9th AF achieved operational success through innovation change, anchored by its units’ core capabilities and the foundation laid by the USAAF in the Middle East between 1941 and 1942. In doing so, this paper will attempt to extract avenues for further research applicable to modern logistical challenges, leveraging the unchanging nature of war inherent to any character-based study.

⁵⁴ Carl von Clausewitz, *On War*, eds. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1984), 89.

CHAPTER 2

INTERWAR YEARS

Historical Context of 9th AF Operations

The conduct of 9th AF logistics during World War II was shaped by the evolution of the USAAF during the inter-war years. The organization that initially settled in the sands of North Africa was an amalgamation of prior decisions and slowly formed leadership prejudices. One can be certain that 9th AF logistics grew from its wartime experiences, but it is impossible to fully understand why or how it grew without a firm understanding of its origins.

USAAF before the war

The history of the USAAF prior to World War II is one of constant struggle within the war department, both for autonomy and resources. In the decade leading up to the war, the War Department and USAAF leadership envisioned different roles for aircraft in modern war. The War Department, highly influenced by ground force commanders, tended to see the USAAF in a ground support role. The USAAF, on the other hand, fully embraced Douhet's ideas of strategic bombing, envisioning airpower as the decisive factor in modern war. This conflict resulted in weak and ambivalent guidance that attempted to alleviate ground force concerns without truly setting any requirements. The War Department compromised by assigning the USAAF the vague

mission of continental defense.⁵⁵ Continental defense merely enhanced the USAAF's dogmatic devotion to strategic bombing, giving rise to the concept of active defense.⁵⁶

To understand active defense and its association with strategic bombing, one must place it in the historical context of technological advancement, airpower theory, and national interests. Immediately following World War I, the USAAF's doctrine was personified in the views of General William "Billy" Mitchell whose aviation priorities were pursuit (air superiority), bombardment (strategic bombing) and attack (support to the ground forces) – in that order. Mitchell firmly believed that air superiority was key – once attained all else followed. However, by 1930 even Mitchell's vision for pursuit had subordinated itself to the overwhelming primacy of unescorted strategic bombing.⁵⁷

Technologically, a confluence of factors, beginning with the 1926 Air Corps Act, was responsible. Driven by industries dependency on government contracts, public support for the airplane, and negative publicity following General Mitchell's court-martial, 1926 Air Corps Act was instrumental in providing both stable funding and the bureaucratic clout to direct it. The Act established the Army Air Corps and gave it a voice on the general staff. It also specifically earmarked aircraft procurement funding,

⁵⁵ Cate and Craven, "The Army Air Arm Between Two Wars, 1919-39," 46-50; Williamson Murray, "Strategic Bombing: The British, American, and German Experiences," in *Military Innovation in the Interwar Period*, eds Williamson Murray and Allan R. Millett (New York: Cambridge University Press, 1996), 106.

⁵⁶ Emmet O'Donnell Jr., Memorandum from Colonel Emmett O'Donnell, Assistant G-3, 10th AF to Brigadier General Earl L. Naiden, Chief of Staff, 10th AF, 5 August 1942, microfiche A1748, AFHRA archives; Cate and Craven, "The Army Air Arm Between Two Wars, 1919-39," 50-53.

⁵⁷ William Mitchell, *Skyways* (Philadelphia, PA: J. B. Lippincott Co, 1930), 278; Perret, *Winged Victory*, 7.

allowing the USAAF to divest itself of over 1,000 obsolete aircraft.⁵⁸ Most importantly, the funding guaranteed by the Air Corps Act was critical to developing the multi-engine bomber.

Funding in hand, the impetus for multi-engine aircraft came from the unlikely arena of the sea. Arguments over the USAAF's role against ships at sea had simmered since General Mitchell arranged for the USAAF to sink a series of obsolete battleships between 1920-1923. These arguments seemed settled in 1931, when Chief of Naval Operations William Pratt and Army Chief of Staff Douglas MacArthur agreed to assign the USAAF the mission of coastal defense. Immediately interpreting their role as destroying enemies as far from the coast as possible, the coastal defense mission spurred procurement requirements for a bomber that could reach far out to sea to destroy approaching battle fleets. Though the USAAF's intrusion into what the Navy long-considered their function stirred inter-service rivalry and resulted in a 1938 War Department order restricting USAAF operations to within 100 miles of the coast, it provided a strategic mission to justify procurement of a long-range bomber.⁵⁹ The result of this search was the multi-engine B-17.⁶⁰

Simultaneously, the increase in range, speed, and bomb-load of multi-engine aircraft had caused many in the USAAF to dismiss the need for tactical aviation, in both

⁵⁸ Irving B. Holley, Jr., *United States Army in World War II: Special Studies, Buying Aircraft: Material Procurement for the Army Air Forces* (Washington, DC: Center of Military History, United States Army, 1989), 46-9, accessed 23 April 2017, http://www.history.army.mil/html/books/011/11-2/CMH_Pub_11-2.pdf.

⁵⁹ Greer, 90-91.

⁶⁰ Perret, 31.

its pursuit and attack roles. This process seemed justified when, in 1933, a series of exercises on the United States' west coast tested the USAAF ability to defend against a foreign invasion. During these exercises, then Lieutenant Colonel Henry "Hap" Arnold conducted a series of tests matching B-12 bombers against the USAAF's first all-metal monoplane pursuit aircraft, the P-26.⁶¹ The P-26s were unable to match the B-12's speed and had difficulty even finding the bombers at night. As a result, Brigadier General Oscar Westover, Assistant Chief of the Air Corps, stated:

Since new bombardment aircraft possesses speed above two hundred miles per hours any intercepting or supporting aircraft must possess greater speed characteristics if they are to perform their missions. In the case of pursuit aviation, this increase of speed must be so great as to make it doubtful whether pursuit aircraft can be efficiently or safely operated either individually or in mass.⁶²

Moreover, the increased lift capability of bombers made a strong defensive armament feasible, giving bombers the capability of defending themselves against fighters should they encounter any.

The consolidation of USAAF opinion in favor of strategic bombing was also necessary for political and fiscal reasons. Politically, it was essential that the USAAF presented a common front. Prior to the publication of Army Regulation 95-5 on 20 June 1941, the USAAF had undergone multiple changes in organization between 1935 and 1941. Each reorganization had attempted to solve the issue of unity of command; however, external elements resisted placing the USAAF under one chain of command. These elements, which included both the Assistant Chief of Staff, G-3 and land forces

⁶¹ Greer, 59; Cate and Craven, "The Army Air Arm Between Two Wars, 1919-39," 64-6.

⁶² Ibid., 65.

Corps Area Commanders, who were concerned with the autonomy and growing power base of the USAAF. Moreover, there was a strong sentiment amongst land forces officers that issues regarding the chain of command were overblown. Land forces officers saw USAAF concerns as a means to separate the air arm from ground commanders to pursue the folly of strategic bombing, rather than bona fide requirements. Additionally, there was concern that a fully equal air arm could divert manpower and funding from the ground forces.⁶³ This concern was borne out in World War II accessions numbers and pre-war procurement requests designed to stimulate the air industry.⁶⁴

The increased pervasiveness of strategic bombing was illustrated by changes in the ACTS syllabi. Throughout the 1930's, ACTS severed as a common training and indoctrination center for rising USAAF leadership.⁶⁵ Moreover, when newly promoted Major General Oscar Westover, Chief of Air Corps from 1935-39 was charged with determining a uniform doctrine to guide USAAF organization and procurement priorities

⁶³ John F. Shiner, "The General and the Subcommittee: Congress and U.S. Army Air Corps Chief Benjamin Foulois, 1934-35," *The Journal of Military History* 55, no. 4 (October, 1991): 497-506, accessed 3 May 2017, <http://www.jstor.org.lumen.cgsccarl.com/stable/pdf/1985766.pdf>; Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941*, 100; Robert F. Futrell, *Ideas, Concepts, Doctrine: A History of Basic Thinking in The United States Air Force* (Maxwell Air Force Base, AL: Air University, 1971), 47-8, 67-8.

⁶⁴ Wilson, "Total War: World War II Planning, Mobilization and War Termination Objectives"; George C. Marshall, "Memorandum for Members, United States Joint Chiefs of Staff regarding 1942-44 accessions," 24 Aug, 1942, Container 92, *President's Secretary's File (Franklin D. Roosevelt Administration), 1933-1945*, Franklin D. Roosevelt Library, Hyde Park, NY. World War II accessions for the Army Air Force comprised 27 percent of all recruits in 1942. Furthermore, the USAAF had a priority on Category 1 recruits—those scoring highest in intelligence and mechanical testing).

⁶⁵ Greer, 51, 53.

he relied heavily on the ACTS.⁶⁶ The shift from a balanced pursuit-strategic bombing-attack doctrine can be linked to the departure of George Kenney in 1931 and Claire Chennault in 1936. Advocates for the attack and pursuit missions, respectively, they were not replaced with like-minded individuals.⁶⁷ In fact, by 1935 bombardment accounted for 310 hours of instruction to pursuits 56 – a number only made possible through Chennault’s tenacity and which dropped after his retirement. Furthermore, attack aviation comprised a single day and only 1/40 of the end of course grade.⁶⁸

Attack aviation’s decline in prominence at ACTS coincided with a noticeable drop in influence and funding, as well as a change in mission. Forced to make funding choices during lean interwar years, the USAAF’s sole attack group was reduced from 4 squadrons to two. Moreover, personnel assigned to each squadron decreased from 130 to 90. Though no specific reason was provided for this drop, attack mission suffered from misalignment with the USAAF’s goal of becoming a separate air force.⁶⁹ Best seen in Training Regulation 440-15, Fundamental Principles for the Employment of the Air Service, the War Department considered attack aviation is an integral part of the ground forces, preferably in a subordinate role. In fact, 440-15 argues that “In most instances this cooperation [close air support] is best accomplished by placing the attack aviation units

⁶⁶ Futrell, 77.

⁶⁷ Greer, 61; Richard. R. Muller, “Close Air Support,” in *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allan R. Millett (New York: Cambridge University Press, 1996), 174.

⁶⁸ Thomas A. Hughes, *Overlord* (New York: The Free Press, 1995), 51-56.

⁶⁹ Muller, 174-5.

directly under the command of the ground commander charged with the tactical handling of the forces involved.”⁷⁰ Within this context, it is understandable that attack aviation would become the black sheep of the USAAF.

At the same time, technology provided both a reason and excuse to shift attack aviation away from its traditional close-support role. Multi-engine aircraft provided the power to increase the bomb load and add armor, but decreased aircraft maneuverability. Already suffering under the handicap of association with ground forces, attack aviation doctrine slowly shifted from the maneuver-intensive close support role advocated by 440-15 and began to concentrate more and more on interdiction of enemy forces beyond the range of artillery.⁷¹

The transitioning mission mirrored the ACTS concepts of light and heavy bombardment.⁷² Light bombardment became synonymous with attack aviation, concentrating on fast-moving low-level bombardment and sacrificing distance for speed. Heavy bombardment supported the concept strategic bombing. From this dichotomy, the multi-engine A-12 attack plane, followed by the A-17 and finally the A-20, flowed as materiel solutions.⁷³ Because of their greater size and weight, these aircraft lacked the maneuverability required for fast-moving battlefield situations or to protect themselves in

⁷⁰ War Department, Training Regulation (TR) 440-15, *Fundamental Principles for the Employment of the Air Service* (Washington, DC: Government Printing Office, 1942), 8.b, 11.b, 13.a-c.

⁷¹ Greer, 67; Perrett, 89; War Department, TR 440-15, 8.a-b.

⁷² Greer, 38-9.

⁷³ Greer, 66-7; Geoffrey Perret, 89-92; Muller, 179-80.

air-to-air combat, but were capability of greater bomb loads and supporters argued that their inherent speed was protection in and of itself.

Finally, there was a financial incentive associated with the USAAF strategic bombing focus. Not only did the USAAF lack appropriate numbers to truly implement strategic bombing, they also lacked the ideal aircraft. In a resource-constrained environment, the USAAF was ‘all in’ on the concept of strategic bombing and escort fighters. The Air Corps Tactical School had delivered the tactics, but the USAAF still had to advocate for the machines.⁷⁴

The USAAF’s logistical structure was also optimized for strategic bombing. Due to decades of non-interventionist leadership, logistical support meant strategic bombing from within the continental United States. Through 1939, bases fell under the jurisdiction of land forces Corps Area Commanders and Army Services Forces supplied all but the most technical and aviation specific means.⁷⁵ In reality, this meant that everything except aircraft parts and aviation-specific munitions were dependent on ground forces supply chains and prioritization. This arrangement worked within the United States, as USAAF airfields were directly connected to national means through well-developed, and often contracted, supply lines. Bases also benefitted from the United States’ geographic security, remaining far from enemy attack with layered, built-up air defenses. In fact, one

⁷⁴ Alfred Goldberg, “The AAF’s Logistical Organization,” in *The Army Air Forces in World War II, Vol VI*, ed. Wesley F Craven and James L. Cate (Chicago: University of Chicago Press, 1955), 200-204; Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941*, 95-100.

⁷⁵ See appendix 1 for breakdown of Air Material Command organization; Goldberg, “The AAF’s Logistical Organization,” 363-5.

of the premises of active defense was to strike the enemy far from shores and never afford them the opportunity to strike a blow! For a strategic bombing-centric force, this was sufficient.⁷⁶

Moreover, USAAF logistics, like the rest of the United States Armed Forces prior to World War II, was small. In fact, as of 1938, the entire USAAF boasted only 18,000 enlisted men and 1,300 officers. This number includes logistics support, flying units, and headquarters staff.⁷⁷ Additionally, much of the depot-level and expert mechanical service performed was done by aircraft manufacturers in a public/private partnership designed to feed a burgeoning industry while providing capabilities beyond the manpower of the relatively tiny USAAF.

Concerned with the size and inherent lack of capability within the USAAF, the Roosevelt administration attempted to dramatically increase its assigned strength from 2320 aircraft to 5500 aircraft in 1939. Congress approved the increase, but election year politics intervened and funding for aircraft procurement was slashed by 110 million dollars.⁷⁸ Congressional attitudes changed dramatically following the Battle of France

⁷⁶ Elmer E. Adler, "Letter from Brigadier General Elmer E. Adler to Lieutenant General Henry Arnold" *Personal Collection of Elmer E. Adler*, AFHRA Archives, Maxwell Air Force Base, AL. Elmer E. Adler, "Letter from Brigadier General Elmer E. Addler to Brigadier General Henry Miller," 3 Sept 1941, *Personal Collection of Elmer E. Adler*, AFHRA Archives.

⁷⁷ Wilson, "Total War."

⁷⁸ Elias Huzar, "Military Appropriations, 1933-1942," *Military Affairs* 7, no. 3 (Autumn 1943): 149-150, accessed 23 April 2017, <http://www.jstor.org.lumen.cgsc.carl.com/stable/pdf/1982883.pdf>.

and spurred an increased demand to build up national military might.⁷⁹ On 12 July, 1940 Secretary of War Henry Stimson authorized the Army's First Aviation Objective. This increased the USAAF to 54 combat groups composed of 4,006 aircraft. Of these, 21 groups supported strategic bombing while only 7 groups were allotted for a light bomber, or attack aviation, role. While 26 groups were allotted to pursuit, the aircraft at the time had limited range and utility outside of defense air superiority. At the prodding of General George Marshall, Army Chief of Staff, the War Department authorized the Aviation Objective, on 14 March, 1941. The Second Aviation Objective increased the USAAF's combat strength to 84 air groups composed of 7,799 aircraft. Though overall aircraft increased, the proportion of strategic bombers in relation to pursuit and attack aircraft increased significantly.⁸⁰ Unfortunately, while the USAAF originally hoped to meet these numbers by March of 1942, lend-lease forced the USAAF to share limited capacity with international partners and slowed initial growth.⁸¹

These issues came to the forefront of USAAF's consciousness during the Louisiana Maneuvers in September 1941. Designed to test the rapidly growing Army's doctrine, leadership, and equipment, the Louisiana Maneuvers were the largest field

⁷⁹ Edwin L. Williams Jr., "Legislative History of the Air Arm," *Military Affairs* 20, no. 2 (Summer 1956): 92-3, accessed 23 April 2017, <http://www.jstor.org.lumen.cgsc.carl.com/stable/pdf/1983218.pdf>.

⁸⁰ In 1940, USAAF authorizations included 951 strategic bombers to 2,198 attack and pursuit aircraft (438 attack, 1,660 pursuit). By 1941, this had shifted to 2,579 strategic bombers to 3,795 attack and pursuit aircraft (770 attack, 3,025 pursuit). The represents a nearly 3-fold increase in heavy/medium bombers over a 2-fold increase in attack aircraft. Futrell, 101-2.

⁸¹ Williams, 93.

exercises ever conducted by the United States Army, involving over 350,000 personnel and 800 aircraft.⁸² Furthermore, the Louisiana Maneuvers was the USAAF's first opportunity to test the employment of tactical aviation on a grand scale.⁸³ Following the exercise, Lieutenant General Lesley McNair, Chief of Staff, Army General Headquarters, credited airpower with enabling the decisive counterattack that ended the war games in the red army's favor. Moreover, Hanson W. Baldwin, Pulitzer Prize-winning war correspondent and noted military author, argued that "perhaps the chief result of the manoeuvres has been the realization by ground generals that air superiority is essential to success in war, mimic or real."⁸⁴

At the same time, the deployment of large numbers aircraft revealed gaping holes in USAAF logistical support. The USAAF set up two Air Corps maintenance commands, each supporting a side. These commands were understaffed and underequipped, immediately encountering issues associated with a lack of trained mechanics, transportation assets, and experience operating outside an established supply system. In the words of the 3d Air Force Commander, then Major General Lewis Brereton, "Our air force was lacking in equipment and trained personnel. We simply could not put supplies

⁸² Christopher R. Gabel, *The U.S. Army GHQ Maneuvers of 1941* (Washington, DC: Center of Military History, United States Army, 1992), iii.; Frederick Graham, "War Games for Planes," *New York Times*, 7 September, 1941, New York Times Archives; Hanson W. Baldwin, "War Games Show Army Still Lags," *New York Times*, 29 September 1941, New York Times Archives

⁸³ G. Patrick Murray, "The Louisiana Maneuvers: Practice for War," *Louisiana History: The Journal of the Louisiana Historical Association* 13, no. 2 (Spring 1972): 129, accessed 23 April 2017, <http://www.jstor.org.lumen.cgscarl.com/stable/pdf/4231247.pdf>.

⁸⁴ Baldwin.

in the places where they should be and in the quantities required.”⁸⁵ Even under the most optimistic forecasts, Army leadership estimated 6 months to a year before sufficient supplies and materials would be available.⁸⁶ This timeline did not include related training in their use. Additionally, USAAFs utilized existing civilian airfields, avoiding mobility issues related to maintaining proximity to front lines or the need to create and maintain airstrips under field conditions.⁸⁷ Further cementing USAAF belief in big sky theory, the maneuvers also highlighted airfields’ vulnerability to attack. Radar was not used and opposing armies consistently failed to provide adequate air raid warning along the entire front, resulting in the neutralization of blue army’s airfields on the second day.⁸⁸ Senior leaders blamed issues on a lack of appropriations; however, the inability of USAAF leadership to envision and prepare for a tactical aviation role had resulted in a logistical force unsuited for air-ground operations.⁸⁹

Fortunately, the USAAF recognized the logistical capability gap and immediately set about patching it. The immediate problem was that existing Air Base Groups (the units which served as nuclei for the Air Corps Service Commands) lacked both mobility and the material capability to operate separate from national means. The USAAF attempted to resolve this through the creation of two additional groups – the Service

⁸⁵ Brereton, *The Brereton Diaries*, 5.

⁸⁶ Baldwin.

⁸⁷ Graham.

⁸⁸ Murray, “The Louisiana Maneuvers: Practice for War,” 129.

⁸⁹ Brereton, *The Brereton Diaries*, 4-5.

Group and the Air Depot Group. Under the USAAF's draft concept, Service Groups would have increased mobility and specialty maintenance capabilities that mirrored Air Base Groups, namely specialty maintenance tasks beyond squadron ground crew's capability and distribute aircraft parts and armaments. Air Depot Groups were deployable units designed to set-up and run air-specific supply depots and perform depot-level maintenance.⁹⁰ Unfortunately, though the USAAF began organizing these units in the spring of 1942, their use in theater, or any other doctrine or regulations concerning their employment, was not published until September of 1942.

USAAF in North Africa (1941-June 1942)

By the time the 3d Air Force was reflecting on what it had learned during the Louisiana Maneuvers, the USAAF had already been involved in North Africa for almost a year. In fact, the presence of United States airpower representatives, both private corporations and the USAAF, predated the United States Army Middle East Air Force's (USAMEAF) arrival in North Africa by almost two years.⁹¹ Starting in November 1940, Colonel Gerald B. Brower and Major Demas T. Craw were assigned to British forces in

⁹⁰ The USAAF divided maintenance into 1st, 2d, 3d, and 4th level maintenance. 1st and 2d-level maintenance consisted of preventative and daily tasks performed by ground crews assigned to combat squadrons. 3d-level maintenance was specialty maintenance that required dedicated equipment and trained specialists; however, both were somewhat mobile with a minimum requirement that all equipment would be truck portable and not require contractor intervention. 4th-level maintenance was commonly referred to as depot maintenance and required dedicated facilities and specially trained personnel. Goldberg, "The AAF's Logistical Organization," 362-4.

⁹¹ The 9th AF initially stood up as the Middle East Air Force, as will be discussed later in this thesis. Source documentation for MEAF includes, Lewis Brereton, "Memorandum: Activation of the Middle East Air Force," 28 Jun 1942, Microfiche B5583, AFHRA Archives.

Cairo as embedded observers. Brower and Craw's goal was to take home a deeper understanding of the use of airpower in modern war.⁹² On a more focused logistics front, the USAAF Material Division sent Captain Edwin S. Perrin to report on the British Maintenance Command in the spring of 1941. Captain Perrin's report was wide-ranging, covering such aspects from anti-aircraft defense to supply to motor transportation.

The initiation of Lend-Lease increased the flow of Americans into North Africa. A combination of British losses and a conscious decision to replace Middle East-based Spitfires with P-40's made North Africa a major destination for Lend-Lease equipment. This consolidation of like aircraft types in each theater was intended to simplified service and supply issues.⁹³ Unfortunately, British Middle Eastern maintenance forces lacked the specialized training necessary to maintain the P-40F. Additionally, the tool requirements for Spitfires and P-40Fs differed, leading to a lack of necessary tools for P-40F maintenance. The American government's solution was to broker service agreements with the American parts and aircraft manufacturers. By the end of 1941, technicians and supervisors from American aircraft companies were established as part of the British aircraft maintenance system. This arrangement benefitted both American and British interests. The British received much needed service support, while the American collected information on equipment issues and best practices. This information was relayed directly to the manufacturer, identifying mechanical defects and maintenance

⁹² Rogers, 2.

⁹³ James L. Cate, "Plans, Policies, and Organization," in *The Army Air Forces in World War II, Vol I*, eds. Wesley F Craven and James L. Cate (Chicago: University of Chicago Press, 1955), 565-6.

solutions.⁹⁴ American support was not limited to contractors. Issues associated with integrating new American equipment into British and Polish air detachments led to the embedded USAAF liaison detachments. While contractors concentrated on providing actual services, these detachments trained allied forces on both operational characteristics and maintenance processes associated with the new equipment.⁹⁵

In June of 1941, Roosevelt directed the Harriman Mission to assess Lend-Lease's effectiveness in North Africa while in transit to the Soviet Union. The mission found that American personnel tended to view operations through the lens of a nation at peace, while the British were entering their second year of war. On the civilian side, American contractors were quick to criticize British techniques, facilities, and the availability of tools.⁹⁶ Brigadier General George Brett, the senior USAAF officer in theater, concurred, citing "a lack of appreciation among certain R.A.F. officers for cooperation with American assistance."⁹⁷ In Brett's eyes, the British lacked the proper appreciation for American help and, more damningly, mid and lower-level Royal Air Force officers failed to properly prioritize American subsistence and facilities support. There were numerous

⁹⁴ One example of this is information concerning P-40 looping tendencies. Mr. Spaulding of the Curtiss Martin Aircraft company relayed a field-expedient fix back to his company via State Department Cable no. 1287, which led to future aircraft including the longer strut. In the true spirit of American capitalism, Curtiss Martin also sold replacement struts to the British Air Commission to upgrade aircraft already received, Cablegram no. 72, to Perrin Field Operations, Denison TX from Cairo, Egypt, "Ground Looping Tendencies of P-40's," 1 October 1941. Rogers, 4, 7.

⁹⁵ Rogers, 6.

⁹⁶ Ibid., 27.

⁹⁷ George Brett, "Code Cablegram from Brett to War Department," 23 September 1941, Folder 1, *Elmer E. Adler Collection*, AFHRA Archives.

incidents “where the R.A.F was using personnel not assigned to it and undertaking duties that had no relation whatever to its customary missions.”⁹⁸ The result was a growing antipathy at the lower levels, heightened by British higher headquarters perceived coddling of Americans. This created concerns for British-American relations, particularly given operations expansion. To alleviate these concerns, the mission recommended the United States establish American-controlled depots and maintenance schools to assist the British. Major General George Brett, assigned to the Middle East in the fall of 1941, echoed these views and began evaluating the area for appropriate facilities.⁹⁹

President Roosevelt acted on the Harriman Mission’s recommendations, directing the War Department to establish air depots for maintenance and supply. He also increased the scale of support to include providing the “necessary port, railroad, and truck facilities to make the supply of American material effective.”¹⁰⁰ Based on the scale of these tasks, the War Department established and consolidated military command under the United States North Africa Military Mission.¹⁰¹ Originally consisting of just 69 personnel and headed by Brigadier General Russell E. Maxwell, the mission’s goal was to advance the

⁹⁸ Ibid.

⁹⁹ George Brett, “Code Cablegram from Brett to War Department,” 23 September 1941; Rogers, 28.

¹⁰⁰ Franklin D. Roosevelt, “Memorandum for the Secretary of War,” 13 September 1941, Folder 1, *Elmer E. Adler Collection*, AFHRA Archives.

¹⁰¹ Rogers, 34.

supply and maintenance of British equipment.¹⁰² This organization would eventually transform into the United States Army Forces in the Middle East on 19 June 1942.¹⁰³

The United States North Africa Military Mission's attention quickly turned to three primary projects, the air depot at Gura, Eritrea; the technical school at Ismailia; and port improvements at Massawa, Eritrea (see Appendix A for map). Seeking to avoid direct military involvement and acknowledging limited military assets, Roosevelt directed a single contractor be responsible for the project.¹⁰⁴ Paid for out of the Lend-Lease Program, Douglas Aircraft Company was selected and given responsibility for establishing the depot, refurbishing the harbor at Massawa, and building a road network between the two. Douglas's mission was two-part. First, they were tasked with assembling and overhauling American engines and aircraft. Second, they were required to trans-ship supplies and parts over 1,100 miles north (by air) to the technical school and forward maintenance depot at Ismailia.¹⁰⁵ The United States North Africa Military Mission considered the Gura depot their highest priority in theater; however, due to the

¹⁰² Ibid., 33-4.

¹⁰³ Ibid., 67.

¹⁰⁴ Franklin D. Roosevelt, "Memorandum for the Secretary of War," 13 September 1941; W. C. G. Cribbett, "Letter from W.C.B Cribbet, Royal Air Force Delegation to the United States to Gernal Spalding, United States Office of Defense Aid," 19 September 1941, Folder 1, *Elmer E. Adler Collection*, AFHRA Archives; Henry H. Arnold, "Cable from Arnold to Brett, Legal Decision Re: Depot," 22 Oct 1941, microfiche A1747, AFHRA Archives.

¹⁰⁵ Rogers, 28-30.

scale of the problem and delays in moving supplies to the area Gura did not commence operations until March of 1942.¹⁰⁶

At the request of the British, the USAAF also established a technical school in Ismailia, Egypt. The technical school's purpose was to familiarize Royal Air Forces with American equipment. The British supplied facilities, supplies, and students, while the USAAF utilized a mixture of contractor and military instructors to provide courses in maintenance, repair, equipment, and supplies.¹⁰⁷ Ismailia also served the dual purpose of forward maintenance depot, leveraging the pool of trained personnel when necessary.

Port of Massawa was the linchpin for these efforts. At this time, Tobruk was the only other British-controlled port North Africa and the Germans controlled the Mediterranean waters it abutted. Massawa, on the other hand, provided a defensible harbor that could be accessed either via the Suez Canal (if the Allies gained control of the Mediterranean) or by rounding the Cape of Good Hope. Regrettably, the harbor was filled with ships scuttled by its prior occupants, the Italians. Douglas also had to reinforce the 80-mile road leading to Gura before heavy cargo could be transferred. Finally, though limited supplies could be ferried by air via a South America-French West Africa route, only limited weights could be transported and French West Africa aerodromes were within range of Vichy French bombers.¹⁰⁸

¹⁰⁶ Henry H. Arnold, "Cable from Arnold to Brett, Priorities and Timing Re: Gura Depot," 28 Oct 1941, microfiche A1747, AFHRA Archives; Rogers, 31, 60.

¹⁰⁷ Rogers, 32-3.

¹⁰⁸ George Brett, "Code Cablegram from Brett to War Department," September 23, 1941; Rogers, 29-30.

The situation in North Africa took on increased importance following the Japanese attack on Pearl Harbor and the ensuing Axis powers declaration of war. Although Brett had sketched preliminary plans for reinforcing North Africa with combat aircraft, it was never a foregone conclusion they would conduct combat operations in the Middle East.¹⁰⁹ In the first place, the United States considered the Mediterranean Theater of Operations (MTO), of which North Africa was the main portion, a British theater. While one could argue that the United States had been fighting a proxy war over the last two years, there were no immediate plans to fight directly. Secondly, American combat power was flowing the opposite way. Japanese pressure in the Pacific compelled the United States to send all available air power to the Far East.¹¹⁰

Enemy action overcame the ideal of a British MTO. The Japanese capture of Wake and Midway closed the United States - South America - Pacific lines of communication and temporarily cut the air route through the Philippines and Australia. Moreover, while the Japanese were busy cutting the eastern air routes, the Germans were both preparing a Libyan offensive and increasing their presence in the oil rich regions of Iran and Iraq.¹¹¹ Furthermore, the Middle East was the sole air route to reinforce an

¹⁰⁹ George Brett, "Cablegram from Brett to Arnold," October 6, 1941, microfiche A1748, AFHRA Archives.

¹¹⁰ Rogers, 42-3.

¹¹¹ Rogers, 48-9; Deborah Wing Ray, "The Takoradi Route: Roosevelt's Prewar Venture beyond the Western Hemisphere," *The Journal of American History* 62, no. 2 (September 1975): 340, accessed 23 April 2017, <http://www.jstor.org/lumen.cgscarl.com/stable/pdf/1903258.pdf>.

increasingly beleaguered Soviet Union.¹¹² Taken together, these elements emphasized the strategic importance of the MTO.

The twin realizations that the MTO could soon become a major American theater of operations and that shipping and time limitations would likely emphasize an air-centric response energized USAAF planning efforts. As part of these efforts, General Elmer E. Adler, the head of the Air Section of the North Africa Mission, echoed General Brett's advice that American forces should be organized as an individual air force. So long as there was no American combatant commander, the American Air Force would receive strategic direction from the Royal Air Force; however, the chain of command would remain entirely American. The decision was justified by the precedent General Pershing established in the World War I.¹¹³ Additionally, although the first aircraft in theater would of necessity operate out of Royal Air Force bases, this was considered a temporary expedient. As soon as possible, American forces would operate out of separate bases and utilize separate lines of communication and maintenance centers to ensure unity of command and avoid stressing already strained British forces. Both proposals won support from British and American leadership.¹¹⁴

Based on these decisions, Arnold ordered the USAAF to establish an air headquarters for bomber, interceptor, and air service commands in the MTO under the

¹¹² John D. Carter, "The Early Development of Air Transport and Ferrying," in *The Army Air Forces in World War II, Vol I*, eds. Wesley F Craven and James L. Cate (Chicago: University of Chicago Press, 1955), 330-2; Ray, 355-6. Cate, "Plans, Policies, and Organization," 570.

¹¹³ George Brett, "Cablegram from Brett for Arnold," 6 Oct 1941; Rogers, 4.

¹¹⁴ Rogers, 45-7.

designation Task Force CAIRO.¹¹⁵ Initially, priority conversations directly between Air Marshall Portal and General Hap Arnold agreed to divert two pursuit squadrons from expected duty in Northern Ireland; however, after high-level meetings in London between General Arnold, Royal Air Force Air Marshall Portal, and Royal Navy Admiral John H. Towers the decision was made to increase American Middle East allocations to six air groups.¹¹⁶ On 23 June, 1942, Marshall echoed the urgency of the situation. Calling the “situation in the Middle East critical,” he instructed General Lewis Brereton of the Tenth Air Force in India to bring all available heavy bombers, sufficient transports and personnel, and divert all aircraft inbound to the Far East to support allied operations in Egypt.¹¹⁷

On 16 June, 1942 General Maxwell was officially relieved as head of the military mission and assumed command of United States Army Forces in the Middle East.¹¹⁸ On 28 June, 1942, the United States Army Middle East Air Force (USAMEAF) was established under Major General Lewis Brereton’s command.¹¹⁹

¹¹⁵ Minutes of the Meetings of the Combined Joint Chiefs of Staff, Post-Arcadia Volume 1, FRD-Map Room Papers, Franklin D. Roosevelt Library.

¹¹⁶ Henry Arnold, “Memorandum of Agreement between Arnold, Towers, and Portal,” 21 Jun 1942, Microfiche 28251, AFHRA Archives; James L. Cate, “Plans, Policies, and Organization,” 566-69.

¹¹⁷ George Marshall, “Cable to CG Tenth Air Force,” Box 1, *Brereton, Lewis H. Military Associate: Papers*, Dwight D. Eisenhower Presidential Library, Abilene, KS.

¹¹⁸ Organizational Authority Record, War Department, U.S. Army Forces in the Middle East. 6/16/1942-3/1/1945; National Archives Online, accessed 23 April 2017 <https://catalog.archives.gov/id/10474942>; Rogers, *The USAAF in the Middle East*, 67.

¹¹⁹ General Order No. 4, United States Army Forces in the Middle East, *Brereton, Lewis H. Military Associate: Papers*, Dwight D. Eisenhower Presidential Library.

Conclusion

The USAAF during the interwar years was characterized by twin fixations on strategic bombing and increased independence. Driven by the confluent factors of technological change, the coastal defense and active defense missions, and limited fiscal resources, the USAAF slowly moved from the three-pillar model of pursuit, bombardment, and attack to one more suggestive of Douhet's strategic focus. Coincident with this shift, the USAAF's belief that the mobility and firepower of aviation necessitated a unified aviation chain of command continued to harden. In turn, the conflict the USAAF's increasing calls for independence engendered amongst Army leadership further alienated the tactical aviation mission so closely tied to the ground forces.

Despite the unpopular position of tactical aviation as war approached, the USAAF nonetheless displayed multiple episodes of innovation that were crucial to tactical aviation's success in the hostile deserts of Northwest Africa. During the General Headquarters Maneuvers in Louisiana and the Carolinas, the USAAF experimented with the service unit concept to enhance tactical aviation's mobility and operational reach. Abroad, the USAAF support to British in the Middle East contribute valuable information on aircraft effectiveness and would lay the logistical infrastructure for operations to come.

CHAPTER 3

UNITED STATES MIDDLE EAST AIR FORCE, JUNE–OCTOBER 1942

In *The Army Air Forces in World War II*, Air Force World War II historian Alfred Goldberg defined logistics as “those services of supply and maintenance necessary for the support of combat units.”¹²⁰ This is an apt enough distillation of the 9th AF’s logistics focus in the Middle East. Separated from the nearest supply source by 10,000 to 14,000 miles and with minimal organic maintenance capability, how did the 9th AF provide the supply and maintenance its tactical aviation forces required to accomplish their operational feats?¹²¹ The answer to this question is best viewed in the context of two separate periods. The first, from June to October, 1942, follows the introduction of USAAF combat forces to the MTO. Rushed into theater in the wake of German successes, this period illustrates tactical aviation logistics ability to adapt in the face of a nearly overwhelming dearth manpower, supplies, or infrastructure. The second period, from October 1942 to May 1943, concentrates on mobility. Chronicling the mad rush across the desert following the breakout at Al Alamein, chapter 4 will demonstrate how 9th AF tactical logistics adapts to the challenges of a mobile, contested battlefield in support of the British 8th Army.

¹²⁰ Goldberg, “The AAF’s Logistical Organization,” 362

¹²¹ Elmer E. Adler, “Letter from Brigadier General Elmer E. Addler to Brigadier General Clements MacMullen,” 21 Sept 1941, Folder 13, *Personal Collection of Elmer E. Adler*, AFHRA Archives.

Situation on the Ground

The USAMEAF's deployment to Northwest Africa was characterized by instability and ad hoc planning. Thrust into a highly fluid tactical situation with orders to assist General Sir Claude Auchinleck, the British Commander in Chief, Middle East, in any way possible, USAMEAF faced immediate pressure to conduct combat operations and an uncertain future as to how or where from.¹²² Indicative of the uncertain operational situation, the USAMEAF was also tasked to prepare for the evacuation of Cairo should Rommel win.¹²³ Taken together, these factors led to a desperate scramble to assemble air assets in theater as quickly as possible. The initial force of heavy bombers was stocked by robbing the Far East of both replacements and forces. Soon after, fighter aircraft and medium bombers were diverted from both England and the planned reinforcement of Soviet forces in the Ukraine.¹²⁴ Belying the urgency of the situation, the 57th Fighter Group traveled from the United States aboard the aircraft carrier USS Ranger. Once off the coast of Africa, pilots performed their first and only carrier launch.¹²⁵ While tactical aviation forces assembled, USAMEAF heavy bombers

¹²² George C. Marshall, "Message 615: Marshall to CG, Tenth Air Force," 23 June 1942, *Brereton, Lewis H. Military Associate: Papers, 1918-67*, Dwight D. Eisenhower Presidential Library; Elmer E. Adler, interview by Intelligence Services, Army Air Force, 18 January 1943, 1, Document Collection, Combined Arms Research Library (CARL), Fort Leavenworth, KS.

¹²³ Brereton, *The Brereton Diaries*, 140.

¹²⁴ Minutes of the Meetings of the Combined Joint Chiefs of Staff, Post-Arcadia Volume 1, *FRD-Map Room Papers*, Franklin D. Roosevelt Library.

¹²⁵ Kenn Rust, *The 9th Air Force in World War II* (Fallbrook, CA: Aero Publishers, 1967), 14.

continued the fight. For the most part operations were restricted to the strategic missions against Libyan ports and shipping, although B-17s did fly one emergency mission targeting German ground forces as British forces continued to retreat.¹²⁶ Tactical aviation forces were slowly growing though. By the end of July, the first trickles of the 57th Fighter Group and the 12th Medium Bombardment Group B-25s had arrived in Northwest Africa.¹²⁷ On 9 August, a combined force of P-40Fs and B-25s flew their first sortie in support of British ground forces, signaling tactical aviation's opening act in the Middle East.¹²⁸

¹²⁶ Kit C. Carter and Robert Mueller, eds. *The Army Air Forces in World War II: Combat Chronology 1941-1945* (Washington, DC: Government Printing Office, 1973), 24, 27, 31

¹²⁷ Carter and Mueller, 31; *Desert Campaign: The Story of the 9th U.S. Army Air Force in Support of the British in North Africa*, 2, Microfiche 35105, AFHRA Archives.

¹²⁸ *57th Fighter Group Sortie Report, 9 August 1942*, microfiche B0154, AFHRA Archives; Brereton, *The Brereton Diaries*, 146; Coles, 48-9.

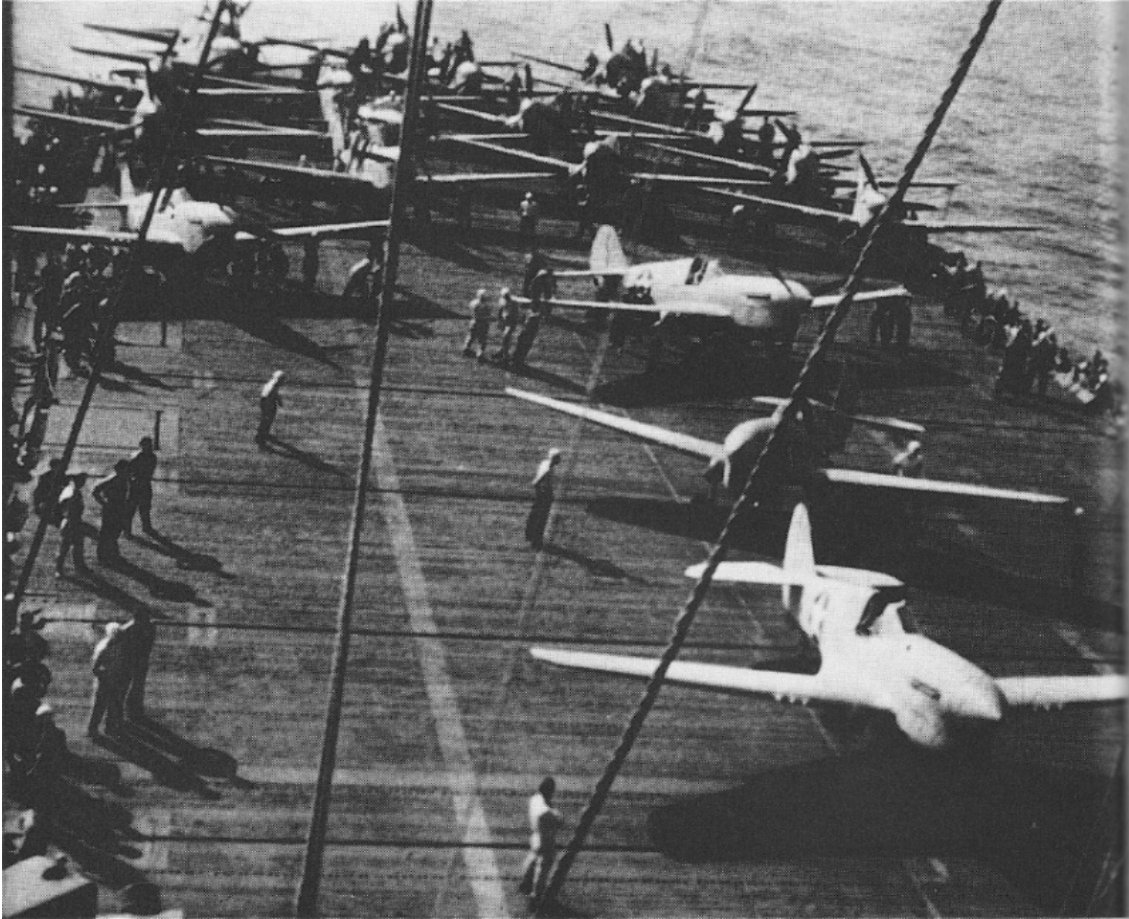


Figure 2. 57th Fighter Group aboard USS Ranger

Source: Office of War Information, Container 3, Photographs of the Allies and Axis, 1942-1945, AEF Africa (N.), Air-9th Air Force, National Archives at College Park.

While the strategic bombing campaign continued unabated, tactical aviation became an increasingly important part of the USAMEAF's contribution to the war effort. This increasing interest in tactical aviation was synonymous with the reorganization of the 9th AF into two combat commands. Demonstrating the dearth of American logistical support in theater and the USAAF's lack of experience with tactical aviation, the USAMEAF's placed the 57th Fighter and 12th Bombardment Groups under the control

of the Royal Air Force's Western Desert Air Force (WDAF). Comprised of British, Polish, and Free French aviation units under the command of Air Marshall Arthur Coningham, the WDAF's mission was to support the British 8th Army in North Africa. Additionally, on 12 October the USAMEAF's strategic arm was formed into the IX Bomber Command. With the USAAF's long experience with strategic operations, and flying from bases closer to sources of supply, the IX Bomber Command was the first American-led and logistically supported task force in theater.

DOTMLPF Logistical Struggles and Adaption

Doctrinal Starting Point

Any explanation of the 9th AF's efforts in Northwest Africa is incomplete without a grounding in how the USAAF expected tactical aviation to operate. This grounding can only be achieved through a review of the state of USAAF doctrine when the USAMEAF stood up on 28 June. At that time, there were three primary sources of USAAF operational doctrine, general Army doctrine, USAAF-specific doctrine, and (since this is, after all, a story of logistics) Army Quartermaster doctrine.

The preeminent Army doctrine manual of the time, Field Manual 100-5, *Operations*, had little to say about USAAF logistics, though it did address leadership.¹²⁹ Concerning aviation leadership, FM 100-5 stated that air task forces "Organization must be flexible. There always should be available trained commanders and staff in adequate

¹²⁹ Walter E. Kretchik, *U.S. Army Doctrine: From the American Revolution to the War on Terror* (Lawrence, KS: University Press of Kansas, 2011), 148-51; War Department, Field Manual (FM) 100-5, *Operations* (Washington, DC: Government Printing Office, 1941), 249, Document Collection, CARL.

numbers for all probable air task forces.”¹³⁰ Given the prioritization of aircraft over units, this doctrine proved difficult to adhere to. In fact, much of the 9th AF’s early organizational issues can be contributed to the lack of trained personnel, both in the USAAF and associated support forces.

Those personnel spent their early days in Northwest Africa guided by the Air Corps and Quartermaster Field Manuals that constituted the bulk of USAAF logistical doctrine at the time. When the USAMEAF was formed in June, logistical concerns in Air Corps doctrine were restricted to two paragraphs on air base requirements. Specifically, Air Corps Field Manual (FM) 1-5 stated “Technical personnel are essential for the operation, maintenance, supply, and repair of aviation equipment in the field.”¹³¹ Furthermore, air bases require facilities for security, rest, replacement, maintenance, and repair.”¹³² The USAAF did publish one additional piece of doctrine concerning logistics in September, Air Corps FM 1-195, *The Service Center*; however, while the 9th AF was aware new doctrine existed they were unaware of its contents despite repeated letters to the Air Material Command in the United States requesting guidance. As such, they had no idea what it said and were blissfully unaware of their complete non-compliance.¹³³

¹³⁰ War Department, FM 100-5, *Operations*, 249.

¹³¹ War Department, Air Corps Field Manual (FM) 1-5, *Employment of Army Aviation* (Washington, DC: Government Printing Office, 1940), 11, Document Collection, CARL.

¹³² War Department, Air Corps FM 1-5, *Employment of Army Aviation*, 11.

¹³³ War Department, Army Air Forces Field Manual (FM) 1-195, *The Service Center* (Washington, DC: Government Printing Office, 1942), Document Collection, CARL; Elmer E. Adler, “Letter from Brigadier General Elmer E. Adler to Brigadier General Clements MacMullen,” 21 September 1942.

Unlike Air Corps doctrine, and as might be expected from a career field whose *modus operandi* is logistics, Quartermaster Field Manuals had much more of an impact of day-to-day operations.

Quartermaster Field Manual 10-5, *Quartermaster Operations*, echoed the need for base support personnel and facilities, applying the same standard of support for air force bases as any normal army unit. In general, this standard included both base support and all classes of supply other than aviation-specific Class V (ammunition) and aircraft-specific repair parts.¹³⁴ Quartermaster FM 10-10, *Quartermaster Service in the Theater of Operations*, goes beyond 10-5, explaining that the Service of Supply (SOS) forces serve dual roles when forces are deployed. First, the service of supply provides quartermaster, base upkeep, and local security.¹³⁵ Secondly, they leverage existing ground force logistics points to supply Army aviation forces.¹³⁶

Unfortunately for the SOS, the mobile nature of aviation operations and aviation's dependence on an in-place logistics infrastructure made leveraging ground force logistics difficult. This challenge was echoed in FM 10-5, recognizing that the "high mobility of the air force, the rapidity of its concentration, and the wide dispersion of its squadrons"

¹³⁴ War Department, Quartermaster Field Manual (FM) 10-5, *Quartermaster Operations* (Washington, DC: Government Printing Office, 1941), 131, 136, accessed 23 April 2017, <https://ibiblio.org/hyperwar/USA/ref/FM/PDFs/FM10-5.PDF>.

¹³⁵ War Department, Quartermaster Field Manual (FM) 10-10, *Quartermaster Service in Theater of Operations* (Washington, DC: Government Printing Office. 1942), 146, accessed 23 April 2017, <https://ibiblio.org/hyperwar/USA/ref/FM/PDFs/FM10-10.PDF>.

¹³⁶ *Ibid.*, 72.

raises mobility concerns specific to the USAAF.¹³⁷ Quartermaster doctrine approached mobility issues by requiring Service of Supply operations be “established and in operation before the arrival of the combat squadrons.”¹³⁸

Logistics Shortfalls and Change

Despite Quartermaster FM 10-10 exhortations, the organization of 9th AF tactical aviation logistics was characterized by the underwhelming lack of SOS forces in Northwest Africa. The lack of SOS forces, more than any other single issue, shaped the USAMEAF’s challenges in the early days of operations. The problem was that doctrine presupposed Army ground forces would be deployed alongside aviation. In the case of the 9th AF, this was simply not true. Northwest Africa was a true aviation-centric mission, in support of a foreign ground force - the British 8th Army. Lacking the ground forces that drove a SOS contingent, the sole SOS forces in Northwest Africa were the G4 staff of the United States Army Forces in the Middle East. When one adds the myriad of other complicating factors - the distance between bases, lack of rail infrastructure, limited ports, and an ever-present enemy threat-the scope of logistics issues faced by the USAMEAF simply expanded; however, the lack of SOS units more than any other single factor forced the IX Air Service Command (IX ASC), USAMEAF’s logistics command, to bridge the gap.¹³⁹

¹³⁷ War Department, Quartermaster FM 10-5, *Quartermaster Operations*, 131.

¹³⁸ Ibid.

¹³⁹ Lewis H. Brereton, “Letter from Lewis Brereton to Henry Arnold,” 21 November 1942, *Personal Papers of Elmer E. Adler*, Folder 1, AFHRA Archives; Elmer E. Adler, “Letter from Brigadier General Elmer E. Adler to Brigadier General Clements MacMullen,” 21 Sept 1942. The 9th Air Force Service command was initially established

The USAMEAF believed that the Gura depot and its accompanying port at Massawa were the lynchpin to accomplishing this build-up. The USAMEAF did not, however, have direct command over it. Guided by doctrine, Maxwell placed these key locations under SOS control; however, due to the lack of available forces and the fact that USAAF forces were the sole American logistics recipient, IX ASC retained “technical direction” and the Gura depot commander was an USAAF officer.¹⁴⁰ The result was a situation where the IX ASC was responsible for running the Gura Depot, but was not in command. Fortunately, this did not create any command and control issues in-theater since IX ASC already performed many of the controlling aspects of the G4. Unfortunately, the IX ASC’s non-doctrinal relationship with Gura introduced manpower issues outside of the theater.

as the IX Air Force Service Command. General Order 2, United States Army Forces in the Middle East, changed the designation to the Air Service Command of the Middle East, or the IX Air Service Command. It again reverted to the 9th Air Force Service Command on 29 January 1944. Between those periods, it was alternately referred to as the ASC and AFSC depending on the correspondent. For the purposes of this thesis, the IX ASC/AFSC will be referred to as the IX ASC in deference to its title during the majority of the period this thesis covers. *General Order 2, United States Army Forces in the Middle East Brereton, Lewis H. Military Associate: Papers, 1918-67*, Box 1. Eisenhower Presidential Library. *Ninth Air Force Service Command*, eds Margretta C. Lasch and Eleanor M. Heins, 16; *History of the IX Air Force Service Command (16 October 1943 to V-E Day)*, IX Air Force Service Command (1945), Microfiche B5997, AFHRA.

¹⁴⁰ Lewis Brereton, Letter from Lewis Brereton to Henry Arnold, 21 November 1942; Elmer E. Adler, “Letter from Brigadier General Elmer E. Adler to Brigadier General Clements MacMullen,” 21 Sept 1942; Lewis H. Brereton, “Commanding General, U.S. Army Middle East Air Forces to Commanding General U.S. Army Forces in Middle East, Subject: Plan of Organization and Operation,” 30 June 1942, microfiche 1748, AFHRA Archives.

USAAF based manpower allotments on the continental United States strategic bombing-based construct, where most duties were performed by SOS units and contractors. The idea of an Air Depot Group managing depot operations independently of the SOS was not new; it had been brewing at the General Headquarters since the Louisiana Maneuvers in 1941, although units were still being formed and regulations governing their use would not be published until August of 1942.¹⁴¹ Regrettably, the combination of the concept's newness and the lack of a command relationship by the IX ASC resulted in neither the manpower necessary to run the depot, nor a viable construct to do so had manpower been available.

The lack of an air depot unit construct and was made worse by the USAAF headquarter's failure to account the USAMEAFs scope of operations. Despite FM 100-5's reminder to be prepared to support additional task forces, the USAAF had never faced the prospect of supplying logistics outside of the established continental system and had not reached the capacity to handle theater logistics independently. Within the USAMEAF, there was a simultaneous need for a theater command, the USAMEAF headquarters, both a strategic bomber (and eventually tactical aviation task forces), the Gura depot and port, and, finally, the Abadan aircraft plant. Against these hefty responsibilities, only 40 USAAF logistics officers were assigned, requiring inventive solutions.¹⁴²

¹⁴¹ Goldberg, "The AAF's Logistical Organization," 369-71.

¹⁴² Abadan was an aircraft assembly plant for the Russian Lend-Lease aircraft located on an island off Iran's coast and jointly administered by USAAF forces and Douglas Aircraft Company personnel, T. H. Vail Motter, *United States Army in World War II: The Middle East Theater, The Persian Corridor and Air to Russia* (Washington,

The situation on the ground further complicated matters. With Rommel rapidly closing on the Cairo-Suez line, Brereton ordered the USAMEAF to establish an advance headquarters in Palestine on 30 July.¹⁴³ Not only did the advance headquarters stretch the lines of communications, it also essentially doubled the logistics headquarters requirements.

The IX ASC's response to these logistical challenges was proactive rather than reactive, seeking to lay the groundwork for future operations. The IX ASC spent July of 1942, its initial month of operations, planning for the intake of additional combat groups. This, in and of itself, is not indicative of a learning organization, nor does it evidence change. After all, manpower restrictions meant that the ASC during this period consisted entirely of a staff and planning is essentially what staffs do; however, the nature of the planning demonstrated a generative approach to the problems facing them. Rather than react to the immediate pressures of German attack by maximizing logistics forward with combat aircraft, IX ASC planning focused on a long-term strategy of maximizing the build-up of both support organizations and supplies to allow for greatest possible long-term.¹⁴⁴ To this end, the debarkation of the 323d Service Group was a key factor.

DC: Center of Military History, United States Army, 2000), 128-33; War Department, Army Air Forces Field Manual (FM) 1-195, *The Service Center*, 6.

¹⁴³ Carter and Mueller, 23.

¹⁴⁴ Elmer E. Adler, Letter from Elmer E. Adler to Clement MacMullen, Deputy Commander, Air Service Command, September 21, 1942; Lewis Brereton, Letter from Lewis Brereton to Henry Arnold, 21 November 1942, Personal Papers of Elmer E. Adler, Folder 1, AFHRA; Lewis H. Brereton, Memorandum from Brereton to Arnold, Subject: Technical Manual No. 1, United States Army Middle East Air Force, 12 October 1942, microfiche A1748, AFHRA Archives.

Arriving on 16 Aug, the IX ASC implemented their plans for the 323d, tasking the dual missions of providing manpower to Gura and setting up an advanced depot to support incoming tactical aviation.¹⁴⁵ Though the mission set before them was something for which they were neither trained nor equipped, it was within their capabilities. Part of the same future concept as Air Depot Groups, the Service Group's role was to conduct deployed third-echelon maintenance within a combat theater. While not envisioned as a mobile depot, the Service Group's core mission did include establishing a forward service center. The mobility envisioned by this role included robust transportation and supply sections to handle the movement and issuance of parts.¹⁴⁶ The IX ASC leveraged these capabilities by detaching a quartermaster company to Gura to assist contracted personnel shortfalls. At the same time, the remaining transportation companies were put to work moving supplies up through Africa to the advance depot at Rayak, Syria. This led to occasional foolishness, such as when a supply convoy became lost and decided to winter in Jerusalem until additional gas could be sent to relieve them (turning a 3-day trip into a 3-month trip). For the most part, however, these convoys proved invaluable to accelerating the movement of supplies forward.¹⁴⁷

¹⁴⁵ Elmer E. Adler, Memorandum to 323d Service Group, Subject: Transfer of Quartermaster Company to Gura, microfiche B0840, AFHRA Archives; Elmer E. Adler, Interview by Intelligence Services, AAF, 18 Jan 1943, 8; *Desert Campaign: The Story of the 9th U.S. Army Air Force in Support of the British in North Africa*, 10.

¹⁴⁶ *Operational History, 323d Service Group*, 9 November 1943, 2, microfiche B0840, AFHRA Archives.

¹⁴⁷ Elmer E. Adler, "Letter from Elmer E. Adler to W. Grohs, Commanding Officer, 323d Service Group," 31 October 1942, Folder 1, *Personal Papers of Elmer E. Adler*, AFHRA Archives.

The facilities at Rayak proved a boon to the establishment of operations and support for tactical aviation. This is even more providential considering that the USAMEAF and British supply service pushed for the establishment of a depot in the Nile Delta region. This would have allowed for rail transport from Gura and located the advanced depot closer to strategic bombing groups; however, the area was unsuitable for aerodromes due to flooding, heavy vegetation, and soil softness.¹⁴⁸ The nearest alternative was the Free French field in Syria, in a town east of Beirut called Rayak. First occupied on Aug 22, 1942, Rayak boasted hardened hangers, warehouses, and loading docks.¹⁴⁹ Had these facilities not been in place, the lack of engineers in theater would have required the 323d to operate out of tents and temporary facilities, both increasing the burden on mechanics and supply personnel, as well as decreasing efficiency given the harsh temperatures and weather conditions.

Despite the 323d Service Group not being the ideal unit for the task, the decision to focus their efforts on the Gura depot and advanced depot missions was in keeping with the USAMEAF's innovative approach to logistics. For instance, rather than allow the Germans to establish the operational tempo by immediately penny-packeting maintenance and support personnel to under-served combat support groups, the USAMEAF's decision to focus on future ops set self-imposed time limits. Additionally, although distributing the 323d's resources to individual units would have resulted in an

¹⁴⁸ Adler, Interview by Intelligence Services, AAF, 18 Jan 1943, 9.

¹⁴⁹ "Special Order 88, Headquarters 323d Service Group, Subject: Movement Orders," 26 November 1942, microfiche B0840, AFHRA; *Operational History, 323d Service Group*, 9 November 1943, 2.

immediate increase in combat effectiveness to the groups already in theater, any benefit would have accrued only to those specific groups. The strengthening of lines of communication and the buildup of port and depot capabilities enhanced logistics for all units in theater, an especially important factor considering the production surge the United States would soon enjoy.

While the IX ASC worked proactively to take advantage of the eventual production surge, tactical aviation demanded an adaptive approach. The crux of the matter was that the USAMEAF simply did not have the capability to support tactical aviation. Rushed into theater in response to German advances, the transfer of aircraft via trans-Atlantic routes and non-standard methods such as launching from the USS Ranger restricted units to “flight kits,” a 3-day collection of spare parts distributed throughout the squadron to maximize limited weight and space.¹⁵⁰ The rapid introduction of tactical aviation demonstrated America’s commitment to the war and provided a much needed boost to British combat power; however, ground support elements were taking the slow route to war via naval transport. The result was over 180 aircraft in theater with no logistical tail and just enough parts to fly for 3-days, assuming they could find a mechanic.¹⁵¹

Forced by circumstances, the USAMEAF temporarily assimilated fighter and medium bomber units into the Royal Air Force. Assigned by squadron to British bases,

¹⁵⁰ Rust, 14.

¹⁵¹ War Department, Table of Basic Allowances, No. 1: Army Air Forces (Washington, DC: Government Printing Office, 1942), 2, microfiche A1748, AFHRA Archives; War Department, Army Air Force Regulation 65-1, *Supply and Maintenance Program of the Army Air Force*, 14 August 1942, Document Collection, CARL

the Royal Air Force exercised both operational command and logistical support.¹⁵² Fully cognizant that this move violated FM 100-5's air task force principles, the USAMEAF broadcasted its intention to relieve British forces of the burden of support as soon as possible. At the time, however, there was simply no other option.¹⁵³ In fact, this action was so unprecedented and contrary to the USAAF's cultural bias that Brereton had to gain General Arnold's personal approval.¹⁵⁴ In the end, the lack of manpower or supply, particularly fuel and parts, decided the situation.¹⁵⁵

Fortunately, the USAAF's Middle East activities in the previous years had created unique conditions to facilitate assimilation. The establishment of the technical training school at Ismailia the year prior ensured British mechanics were trained on the maintenance of B-25 and P-40F aircraft.¹⁵⁶ Maintenance interoperability was further enhanced by the Royal Air Force's decision to swap Spitfires for P-40Fs the previous

¹⁵² Lewis H. Brereton, "Memorandum from Brereton to Arnold, Subject: Technical Manual No. 1, United States Army Middle East Air Force," 12 October 1942, microfiche A1748, AFHRA Archives; IX ASC Technical Manual #1, *Supply and Maintenance of the U.S. Army Air Force Units in the Middle East Theatre of Operations*, 6 October 1942, 7-19, microfiche A1768, AFHRA Archives; Lewis H. Brereton, "Memorandum from Brereton to Air Marshal Peter R.M. Drummond," 19 September 1942, 6, microfiche A1748, AFHRA Archives;

¹⁵³ IX ASC Technical Manual #1, *Supply and Maintenance of the U.S. Army Air Force Units in the Middle East Theatre of Operations*, 6 October 1942, 2.

¹⁵⁴ Lewis H. Brereton, "Personal letter from Brereton to Arnold," 21 November 1942, Folder 1, Personal Papers of Elmer E. Adler, AFHRA Archives.

¹⁵⁵ Godlberg, "The AAF's Logistical Organization," 363.

¹⁵⁶ Adler, Interview by Intelligence Services, AAF, 18 Jan 1943, 8.

year, leading to a commonality of parts in theater.¹⁵⁷ Unfortunately, through the Royal Air Force mechanics utilized the same tools and trained on the same aircraft, the increase in aircraft did not coincide with an immediate increase in logistics. Moreover, American crews were forced to rely on the same base infrastructure and base service units as the British, further depleting little logistics available.¹⁵⁸

American forces were neither equipped nor organized to mitigate the logistics shortfall. The nature of desert operations, namely long lines of communications and a lack of transportation infrastructure, required increased mobility assets. In the words of the 66th Fighter Squadron's official history, "Every gallon of gasoline, every round of ammunition, every case of food, and every drop of water used by the Squadron had to be transported into camp from dumps miles away, entirely by truck."¹⁵⁹ Furthermore, USAAF organizational tables did not reflect this reality, authorizing only 12 vehicles per combat squadron. In reality, however, conditions were even worse. Difficulties transporting vehicles between the port and airfields, as well as transport losses at sea, reduced some squadrons allotments to a single truck. The lack of vehicles was also indicative of USAAF strategic basing assumptions, which assumed there would be a nearby supply depot and that the SOS would handle most supply movements. In the

¹⁵⁷ Cate, "Plans, Policies, and Organization," 565-6.

¹⁵⁸ The USAMEAF utilized every spare bit of the British's space and capability. In fact, based on space and logistics limitations, the 65th Fighter Squadron was temporarily assigned to Nicosia, Cyprus and only relocated once the 57th Fighter Group consolidated under American leadership later that year. Rein, *The North African Air Campaign*, 52; Rogers, *The USAAF in the Middle East*, 32-3.

¹⁵⁹ *History of the 66th Fighter Squadron*, microfiche A0748, AFHRA Archives.

desert, the nearest supply depot could be hundreds of miles away and the nearest SOS unit was even further.¹⁶⁰

Fortuitously, the arrival of American aircraft in the North Africa was immediately preceded by the delivery of almost 5,000 lend-lease trucks. Originally intended as a mobility stopgap pending the availability of armored tanks, priorities suddenly shifted with Rommel's success in Northwest Africa. Alarmed by the possibility of losing the Russian air-bridge, British armor priority for Northwest Africa spiked, diverting tanks American forces.¹⁶¹ As a result, the trucks intended for ground forces were made available to the British Royal Air Force. While this did not create excess capacity, the sudden influx of trucks did allow the Royal Air Force to fully equip their units. The transfusion of motor vehicles also provided a transportation pool for the newly arrived American forces to draw on. Recognizing both the importance of tactical aviation and of involving their American allies in the fight, the British again slimmed their tables of organization by placing all non-combat unit vehicles at American disposal.¹⁶² As a result,

¹⁶⁰ Adler, Interview by Intelligence Services, AAF, 18 Jan 1943, 7.

¹⁶¹ United States Army Service of Supply Memorandum, Subject: Lend-Lease Truck Production for Middle East, 20 April 1942, Box 2342; Textual Reference, UD-UP 296, National Archives at College Park; United States Army Service of Supply Memorandum, Subject: Tank Allotments, 11 March 1942, Box 2342, Textual Reference, UD-UP 296, National Archives at College Park.

¹⁶² Peter R. Drummond, "Memorandum from Air Marshall Drummond, Deputy Air Officer Commanding-in-Chief Middle East to Major General Lewis H. Brereton, Commanding General, United States Army Middle East Air Force, Subject: Anticipated Demands to be Made Upon the R.A.F. for Maintenance and Supply," 26 September 1942, microfiche A1748, AFHRA. Lewis H. Brereton, "Address at Rollins College on Role of the Armed Forces in Combat," *Brereton, Lewis H. Military Associate: Papers, 1918-67*, Box 1. Eisenhower Presidential Library

USAMEAF tactical aviation boasted sufficient transport capability to meet organic supply requirements by September of 1942.¹⁶³

These trucks were put to good use as the ground elements of the 12th Bombardment Squadrons and the 57th Fighter Group arrived in August of 1942. Maintenance personnel were immediately pressed into the dual roles of assisting Royal Air Force base service units and maintenance; however, dual-hatting maintenance personnel came with a cost. In a purely physical sense, double-shifts exhausted personnel. Moreover, the necessity of operating convoys to and from the growing advance depot at Rayak created incessant ground crew shortfalls for days at a time. Finally, as aircraft were exposed to dust and combat conditions, the wear on aircraft drove an increasingly high maintenance burden.

Conclusion

Escalating manpower deficiencies, chronic supply shortages, and non-standard logistics constructs characterized USAMEAF tactical aviation in its first months of existence. Regrettably, USAAF was unable to turn to doctrine for answers. With a focus on establishing air task forces, the necessity of an established supply infrastructure and attendant SOS forces, and the inflexible bases service structure emblematic of the continental United States system, doctrine poorly suited to the ad hoc establishment of a new Air Force in the Middle East.

Fortunately, the USAMEAF did not start with a blank canvas. The generative processes demonstrated by the USAAF prior to its entry set the stage for future combat

¹⁶³ Rogers, 98-9.

operations. The USAAF's innovative operations in support of the Royal Air Force between 1941 and 1942 created an environment remarkably conducive to American operations. From the technical school in Ismailia to the Air Depot in Gura, the facilities and organizations intended to increase the combat effectiveness of British Airmen and provided a solid logistical basis for American operations. Additionally, the commonality of British and American parts based on the United States' lend-lease effort also proved a vital stopgap during the USAMEAF's early days of the war.

Operating from the pre-war structural framework, the USAMEAF approached logistical challenges in two ways. The first (outlined in Appendix B), was through a generative, innovative approach aimed at severe DOMF gaps in theater supply capabilities. Organizations, the biggest challenges were the lack of SOS personnel to establish advanced depots and man the Gura theater depot. This was complicated by material gaps in both the vehicles required to haul supplies and the actual supplies. Finally, while there were basic facilities in theater, none were operating at their full capacity and there was no 3/4th level maintenance service center at all. The IX ASC's application of the 323d Service Group to these issues typified an innovative learning organization.

While the 323d provided some support to current operations, they were primarily postured to solve future problems before tactical aviation forces became overwhelmed by operations. The 323d largely filled the organizational gaps left by the lack of SOS forces, bolstering Gura's manpower and establishing a forward depot in Rayak. At the same time, a combination of borrowed British vehicles and drivers from the 323d's Transportation Companies strengthened the USAMEAFs anemic lines of communication.

Throughout this process, the IX ASC refused to let German actions force an immediate reactionary response. Moreover, the 323d Service Group's actions emulated Farrell's charge to "explore new capacities by developing new modes and means of operations."¹⁶⁴ Additionally, while only modest increases in operational efficiency were seen, specifically in the ability of tactical aviation forces to requisition limited supplies from Rayak, the USAMEAF adhered to the end goal of future operational efficiency.

The reciprocal of the USAMEAFs generative actions to establish its logistical infrastructure was the adaptive means used to bed down its tactical aviation combat units. Outlined in Appendix C, the USAMEAF dealt with the DOMF capability gaps of missing SOS base service units, delayed ground element arrivals, minimal parts and supplies, and no established facilities through the assimilation of American units into the Royal Air Force. The choice to absorb American units into the British forces allowed Germany to dictate the timeline, spurring the United States to commit the 57th Fighter and 12th Bombardment Groups in the absence of secure ground lines of communications (or even ground crews!). At the same time, the assimilation of USAMEAF tactical aviation into Royal Air Force units followed Farrell's model for how learning organizations practice adaptation. In this case, the USAMEAF exploited existing British Royal Air Force core competencies and simply fed more bodies into the grinder as ground crews became available. In doing so, USAMEAF was able to meet Grissom's requirements for increased mission effectiveness, even if those efforts were unsustainable in the end. Fortunately for the allies, a changing situation on the ground, increased stateside

¹⁶⁴ Farrell, 570.

production, and, most importantly, the USAMEAF's generative actions to build their logistical infrastructure meant that the 57th Fighter and 12th Bombardment Group would not have to maintain an unsustainable pace.

CHAPTER 4

9TH AIR FORCE AND THE DESERT AIR TASK FORCE'S DRIVE TO TUNISIA, OCTOBER–JUNE 1943

Situation on the Ground

While the USAMEAF hastened to create the IX Bomber Command, tactical aviation's progress towards an independent force was decidedly slower. Primarily due to the strained logistical situation on the ground, the assimilation of USAMEAF tactical aviation into Royal Air Force units had nonetheless yielded operational benefits. The delay provided an opportunity for theater logistics to mature, allowing personnel, supplies, and skill sets to slowly build. At the same time, tactical aviation forces were able to begin flight operations almost immediately, simultaneously leveraging British logistical knowledge of the harsh desert environment and operational relationships with the ground forces to assist the 8th Army's during their desperate defense against Rommel. However, both the logistics and operational picture began to change as the long-awaited British offensive commenced.

Operating as part of the WDAF, USAMEAF aircraft from the 57th Fighter and 12th Bombardment Groups played a critical role in the Battle of Alamein, which raged from October to November of 1942.¹⁶⁵ USAMEAF P-40Fs served as bomber escorts and maintained British air superiority through offensive and defense air sweeps with remarkable results. Though American fighters consisted of just an eighth of the total fighter force, they accounted for 40 percent of German air-to-air losses, losing only 6

¹⁶⁵ Coles, 48-56.

aircraft to the German Air Force's 41.¹⁶⁶ At the same time, B-25s medium bombers and P-40Fs acting as fighter-bombers attacked lines of supply, vehicles, and troop concentrations up and down the front.¹⁶⁷

The Battle of Alamein also coincided with further restructuring of the USAMEAF. On 22 October 1942, Brereton formally took operational command of the Desert Air Task Force, placing all USAMEAF WDAF units under American operational command.¹⁶⁸ More momentous was the USAMEAF's formal designation as the 9th AF.¹⁶⁹ In this new guise, the 9th AF continued its advance across North Africa from November to May 1943.¹⁷⁰ Following closely behind the 8th Army as they pushed Rommel's forces into Tunisia, the 9th AF moved in lockstep behind the front lines, coordinating closely with their Royal Air Force brethren and flying between 1/8 and 1/2

¹⁶⁶ Henry H. Arnold, "Message 1720, Arnold for Brereton," 8 November 1942, Box 1, *Brereton, Lewis H. Military Associate: Papers, 1918-67*, Eisenhower Presidential Library; Elmer E. Adler, interview by Intelligence Services, Army Air Force, 18 January 1943, 1; *Desert Campaign: The Story of the 9th U.S. Army Air Force in Support of the British in North Africa*, 2; Coles, 56-7.

¹⁶⁷ Coles, 56-7.

¹⁶⁸ Thomas J. Mayock, "Crisis in the Middle East," in *The Army Air Forces in World War II, Vol II*, eds. Wesley F Craven and James L. Cate (Chicago: University of Chicago Press, 1955), 34.

¹⁶⁹ To avoid confusion, from this point on all references to USAMEAF or 9th AF will use the term 9th AF.

¹⁷⁰ *Memorandum for Command General, Headquarters Third Air Force, Subject: Ninth Air Force Battle Participation*, 15 October 1945, Box 1, *Brereton, Lewis H. Military Associate: Papers, 1918-67*, Dwight D. Eisenhower Presidential Library; Coles, 73.

percent of all combat operations on any given day.¹⁷¹ The arrival of additional combat groups facilitated this battle, with the 79th Fighter Group arriving on 2 November and the 324th arriving on 23 December.¹⁷² Echoing the 57th Fighter Group's assimilation into Royal Air Force squadrons, these groups initially provided individual crews and aircraft to bolster the 57th Fighter Group's strength (see Appendix E for route of march and operational statistics).

Later, on 14 March 1943, when the 8th Army was finally rebuffed at the Mareth Line in Tunisia, the crews of the 79th Fighter Group at last flew their first mission under their own guidon.¹⁷³ The 324th Fighter Group followed the next month, flying their first mission as a unit on 18 April 1943.¹⁷⁴ By June of 1943, the 9th AF's tactical aviation had consolidated in Tunisia and was ready to commence Operation HUSKY, the invasion of Sicily.

¹⁷¹ Rogers, 134.

¹⁷² 57th Fighter Group Sortie Report, 9 August 1942; History of the 324 Fighter Group, microfiche B0273, AFHRA Archives; Edith Rogers, USAF Historical Studies No. 108, *The USAAF in the Middle East: A Study of the Origins of the Ninth Air Force*, 113.

¹⁷³ Rick Atkinson, *An Army at Dawn: The War in North Africa, 1942-1943* (New York: Henry Holt and Co, 2002), 421-441; *The Falcon: Combat History of the 79th Fighter Group: United States Army Air Forces, 1942-1945*, ed. Ragnar G. Lind (Munich, Germany: F. Bruckman, 1946), 189.

¹⁷⁴ History of the 324 Fighter Group.

DOTMLPF Logistical Struggles and Adaption

Doctrinal Starting Point

The period of October 1942 to May 1943 saw only one major change in USAAF doctrine, the publishing of Army Air Forces (AAF) FM 1-5 on January 18, 1943. While this document failed to foresee some elements of warfare in Northwest Africa, it did make great strides in consolidating logistical support under the USAAF umbrella.

The primary gap in AAF FM 1-5 was a lack of appreciation for the speed or distance of the advances in modern warfare, particularly in a desert environment. For instance, though AAF FM 1-5 argued “Aircraft can operate at any point within a wide area without the necessity for moving their bases, and air action can be applied with extreme rapidity at decisive points.”¹⁷⁵ Partly this reflected the USAAF continued fixation on strategic bombing. With some innovative practices that improved range and speed, even medium bombers were capable of striking from fixed bases along a rapidly moving front. Be that as it may, the perception of air to ground combat as the domain of the multi-engine bomber neglected the role of the relatively short-ranged fighter-bombers that comprised over half of the Desert Air Task Force.

However, while AAF FM 1-5 may have fallen short of envisioning mobile basing, it made great strides in envisioning a mobile service force. This similarity was unsurprising, as AAF Regulation 65-1 (published in August 1942) had described the functions of service groups. The key difference between the 1940 and 1943 version of

¹⁷⁵ War Department, Army Air Forces Field Manual (FM) 1-5, *Employment of Aviation of the Army* (Washington, DC: Government Printing Office, 1943), 37, Document Collection, CARL.

FM 1-5 was the focus on attached units for logistics purposes and the centrality of air bases to command and control relationships. The 1940 version of FM 1-5 stated that “personnel of the various arms or services trained for rendering service” could be “assigned or attached” as air base forces.¹⁷⁶ The 1943 version of FM 1-5 lacked this centrality of air bases, instead viewing service support as a unit function. By declaring that “units are organized for the purpose of maintenance and supply and for facilitating air operations” without an air base caveat, the 1943 version of FM 1-5 provided a doctrinal backing for the Service Group and Air Depot Group independent of the establishment of air bases. This provision would prove key, as air bases in the desert often proved transitory and some service units spent more time in transit than on location.¹⁷⁷

Logistics Shortfalls and Change

As the 8th Army won battle after battle, the twin concerns of distance and mobility continued to plague 9th AF’s tactical aviation logistics in Northwest Africa. Of course, one could add weather, lack of supplies, the dearth of trained technical experts, and more to this mix, but *mobility* and *distance* were the underlying issues that heightened every other concern. As the IX ASC did in their first months in theater, they once again turned to the 323d Service Group for solutions. One of the first places the 323d was needed was at the fighter squadrons.

¹⁷⁶ War Department, Air Corps FM 1-5, *Employment of Army Aviation*, 6-7.

¹⁷⁷ War Department, Army Air Forces FM 1-5, *Employment of Aviation of the Army*, 7.

In an example of the action-reaction nature of adaptation, maintenance personnel performing double-duty as base service personnel soon became unsustainable. The high-ops tempo associated with the Battle of Alamein in late October and the continued degradation of aircraft in the dust-choked conditions of the desert required more and more maintenance to keep aircraft flying. Coupled with the lack of forecasted SOS personnel in theater, the IX ASC made the decision to spread 323d personnel throughout tactical aviation units to relieve ground crews of traditional SOS supply and base services duties. In some ways, the 323d was actually better suited to base services duties, as four quartermaster companies were assigned to conduct the envisioned service and supply missions.¹⁷⁸ By early November, the 57th Fighter and 12th Bombardment Groups received base service detachment to fill the SOS' quartermaster role. These detachments would not only transport supplies to and from forward airfields, they would also clothe and feed 7,000 personnel through March 1943.¹⁷⁹

In many ways, the detachment of base services personnel was made possible by the generative innovation of the IX ASC in early days of war. The advanced depot in Rayak now had a stockpile of parts and equipment. Additionally, the IX ASC had prioritized mobility for the 323d. As a result, the 323d was fully mobile with sufficient organic transportation for base service detachments. Additionally, in what would become had already become a trend for new 9th AF units, additional service units began to arrive

¹⁷⁸ Adler, Interview by Intelligence Services, AAF, 18 Jan 1943, 9; War Department, Quartermaster FM 10-10, *Quartermaster Service in Theater of Operations*, 146-52; *Operational History, 323d Service Group*, 9 November 1943, 2, 5.

¹⁷⁹ *Operational History, 323d Service Group*, 9 November 1943, 5.

– albeit without their equipment!¹⁸⁰ The first service group to arrive was immediately tasked to support the IX Bomber Command. Though this group would not receive their equipment until March of 1943, their assignment to the Bomber Command effectively relieved the 323d of its requirement to support the 98th Heavy Bombardment Group and allowed them to focus exclusively on tactical aviation. An Air Depot Group quickly followed on 2 November, again without equipment; however, their assignment to Gura relieved the 323d Service Group of that mission as well.¹⁸¹

The assignment of base services detachments also spelled the slow transition of 9th AF tactical aviation forces to an American supply chain, initially concentrated out of Rayak. To facilitate this transition, the IX ASC implemented procedures where the newly assigned supply officers could request American supplies from the 323d Service Group through the Royal Air Force supply officer.¹⁸²

The decision to utilize an American supply chain was a carefully considered move towards American autonomy. As the arrival of supplies at Gura accelerated, a decision had to be made on whether to funnel supplies through existing British channels as had been occurring or set up an exclusively American supply chain. Although the simpler decision in the short run would have been to continue funneling supplies into the shared British-American supply chain, there was concern over the long-term consequences of

¹⁸⁰ Adler, Interview by Intelligence Services, AAF, 18 Jan 1943, 10, 24.

¹⁸¹ Elmer E. Adler, “Memorandum for Commanding General, United States Army Force in the Middle East, Subject: Certain Logistical Requirements of the Army Air Forces, Middle East,” 9 August 1942, microfiche A1748, AFHRA Archives.

¹⁸² IX ASC Technical Manual #1, *Supply and Maintenance of the U.S. Army Air Force Units in the Middle East Theatre of Operations*, 6 October 1942, 4-5.

such an action. Namely, the 9th AF was convinced that if the British maintained supply-chain control, American units would see very little of those supplies. This belief necessitated both an American chain of command and forward depot and service centers to distribute materials.¹⁸³

The availability of supplies and feasibility of an American-only supply chain dramatically improved with the opening of the Suez Canal; however, a lack of port teams also necessitated further adaptation. While port logistics teams clearly fell under the SOS mission set, the American forces planning to conduct the Torch landings in November maintained first call on these assets. As a result, SOS port teams were unavailable for duty in Northwest Africa until February 1943.¹⁸⁴ In a case of pure adaptation forced on them by immediate crisis, it fell to the 323d Service Group to dispatch a port quartermaster detachment to receive and distribute supplies.¹⁸⁵

The multitude of duties assigned to the 323d Service Group was indicative of the Desert Air Task Force's stretched logistics chain and largely shaped the employment of fighter and medium bomber forces. The key to operating within this chain was innovation--proactively incorporating all applicable DOTMLPF elements across the organization to achieve increased mission effectiveness while operating against an internal time limit rather than constantly reacting to the enemy. Constant reaction to the

¹⁸³ Lewis H. Brereton, Memorandum from Brereton to Air Marshal Peter R.M. Drummond, 19 September 1942, 1, microfiche A1748, AFHRA; Lewis H. Brereton, Memorandum from Brereton to Arnold, Subject: Technical Manual No. 1, United States Army Middle East Air Force, 12 October 1942, microfiche A1748, AFHRA

¹⁸⁴ Adler, Interview by Intelligence Services, AAF, 18 Jan 1943, 9.

¹⁸⁵ Ibid.

enemy could not be entirely avoided due to the necessity to maintain momentum and contact. Still, the alignment of DOMF factors shaped *how* momentum and contact, allowing the Desert Air Task Force to maintain initiative and avoiding constant reactionary adjustments to operational practices. In short, proactive, generative adaptation allowed the Desert Air Task Force to avoid reactionary adaptation.

Desert Air Task Force fighter forces accomplished this innovation by emulating a British movement termed ‘leapfrogging.’ Code-named Operation Buster by the 9th AF, the 66th Fighter Squadron, or “Force A” as it was called in Field Order #1, was maintained forward of the remaining 57th Fighter Group squadrons, or “Force B.”¹⁸⁶ To ensure the viability of the Force A, Administrative Order #1 directed that 66th Fighter Squadron combat power was maintained at all times, replacing personnel and aircraft from 57th Fighter Group resources as necessary.

¹⁸⁶ Field Order #1, United States Army Middle East Air Forces, 16 October 1942, 7, *World War II Combat Operations Report, 1941-1945*, 12th Bomb Group to 12th Bomb Group, Box 98, Textual Reference, NM-6, entry 7, National Archives at College Park.



Figure 3. 9th AF Mobile Repair Team at an advanced American base in North Africa

Source: Office of War Information, Photographs of the Allies and Axis, 1942-1945, AEF Africa (N.), Air-9th Air Force, National Archives at College Park.

Moreover, the IX ASC directly allocated additional logistics resources to Force A, such as two mobile vehicle repair teams and a mobile aircraft repair team from the 323d Service Group.¹⁸⁷ Although the remaining 57th Fighter Group squadrons flew numerous missions throughout the campaign, their primary purpose was to preserve a fully mission-capable fighter-bomber force directly behind the 8th Army front lines. The deliberate

¹⁸⁷ Administrative Order #1 to accompany Field Order #1, *World War II Combat Operations Report, 1941-1945*, 12th Bomb Group to 12th Bomb Group, Box 98, Textual Reference, NM-6, entry 7, National Archives at College Park.

feeding of a single fighter squadron ensured mobility and mission readiness in the face of limited logistics.

Table 2. 66th Fighter Squadron Landing Grounds (LG) from November 1942–March 1943					
Date	Location	Distance Traveled	Date	Location	Distance Traveled
1 Oct	LG 174	--	29 Nov	Bellandah LG	193 Miles
6-Oct	LG 91	8 Miles	12-Jan	Hamariet LG	110 Miles
2-Nov	LG 306	88 Miles	17-Jan	Darragh West LG	166 Miles
5-Nov	LG 106	5 Miles	23-Feb	Tripolitania LG	216 Miles
9-Nov	LG 101	79 Miles	5-Mar	Nefatia South LG	100 Miles
11-Nov	LG 76	105 Miles	6-Mar	Nefatia Main LG	4 Miles
13-Nov	LG 142	145 Miles	7-Mar	Zuara LG	40 Miles
15-Nov	LG 92	60 Miles	10-Mar	Ben Gardane East LG	65 Miles
20-Nov	LG 73	83 Miles	20-Mar	Zoltane LG	35 Miles

Source: Created by author, data from Organizational History, 66th Fighter Squadron, microfiche A0748, AFHRA Archives.

The reorganization of the 57th Fighter Group and realignment of DOMF capabilities extended to individual squadron operations. Within squadrons, units were further divided into ‘A’ and B’ teams. ‘A’ team would move in and set up the airfield close to the front. Squadrons were aided in the process by the unique process of building a desert airfield. Advance teams would mark off one of the numerous level areas near a highway by gasoline drums at each of the four corners. Bulldozers or scrapers would quickly level the field or scrape loose rocks between the drums, followed erecting a

windsock at the field. Within hours, the field was ready for business. Squadron shops and living areas were next, covering a considerable amount of space due to the dispersal of the tents. Dispersal was considered a necessity, as German Luftwaffe bombers constantly threatened forward airfields. To concentrate anything, be it aircraft, gasoline, ammunition or personnel, invited disaster.¹⁸⁸ The 'B' team would follow after aircraft had abandoned the previous airfield and then join the rest of the squadron.¹⁸⁹ An anonymous letter attached to the 57th Fighter Group's December, 1942 operational reports explains this process well:

And now here are a few facts about the "advance party." There were a few men from every section of the squadron but we numbered less than 50, including officers. These men did the work of twice that number. A few short hours after a site had been selected we had a thriving camp – mess hall tents up and warm chow about ready to be served, personnel tents up, slit trenches dug and other incidentals completed. It was all work but not a man griped about the things he had to do. We were the beginning and the nucleus of every camp for it was after we were settled that the planes and crews and more ground personnel followed. Every move meant 1 to 3 days without washing the perspiration from our hand and faces as we had by one canteen of water for each man until we reached our destination. On most moves, rifles and tommy guns were close at hand for immediate use against any sort of an attack. I usually had a tommy gun laying across my lap. It gave me a certain sense of security. . . . At times we were so close to the enemy lines that we were awakened during the night by the roar of artillery fire. We were always within range of enemy bombers.¹⁹⁰

¹⁸⁸ *The 12th Bombardment Group (Medium) in the Mediterranean Theater*, 5, Box 16, Archives of the Ninth Air Force Association, The University of Akron University Libraries Archival Services, Akron, OH; History of the 66th Fighter Squadron.

¹⁸⁹ Coles, 76-7.

¹⁹⁰ Unsigned letter contained in 9th AF correspondence folder stapled to report of 57th Fighter Group movements, *World War II Combat Operations Report, 1941-1945*, 12th Bomb Group to 12th Bomb Group, Box 98, Textual Reference, NM-6, entry 7, National Archives at College Park.



Figure 4. A 9th AF convoy at a rest stop before continuing to moving to a new landing ground in North Africa

Source: Official U.S. Air Force Photo, Photographs of the Allies and Axis, 1942-1945, AEF Africa (N.), Air-9th Air Force, National Archives at College Park.

Beyond internal reorganization, the 57th Fighter Group's ability to maintain mobility and readiness requirements was also bolstered by the arrival of the 79th and 324th Fighter Groups. The cumulative effect of constant combat and harsh desert environment voraciously consumed both planes and aircrew. Countering this erosion of combat power, aircraft and pilots from the 79th and 324th Fighter Groups were fed piecemeal to the 57th Fighter Group as they arrived in theater. The material and manpower flow served multiple purposes. First, it enabled the immediate use of

additional combat power. Following the standard set by the 57th Fighter Group, the 79th and 324th Fighter Groups presaged their ground elements by up to 3 weeks. Had these groups remained intact, the lack of trained maintenance personnel and limited base services would have effectively grounded them.¹⁹¹

Secondly, limited cannibalization policies turned the forward flow of aircraft into an airborne line of communication, ensuring the availability of aviation-specific parts and even ammunition on the front lines. The cannibalization of aircraft was a deliberate, formalized effort that took into account both immediate and long-term consequences.¹⁹² Cannibalized aircraft were tracked and, when units moved, transported to the advanced depot for storage pending increased parts availability. With the opening of several Mediterranean ports, availability of aviation supplies gradually increased and by March 1943 all non-combat loss cannibalized aircraft were returned to service.¹⁹³ Generally seen as a desperate reactionary adaptation, cannibalization in Northwest Africa defied stereotypes. By regulating the process and planning ahead based on supply estimates, the IX ASC turned catastrophic adaptation into innovative change that increased both current and future combat effectiveness.

¹⁹¹ *The Falcon: Combat History of the 79th Fighter Group: United States Army Air Forces, 1942-1945*, 187-9; History of the 324 Fighter Group.

¹⁹² IX ASC Technical Manual #1, Supply and Maintenance of the U.S. Army Air Force Units in the Middle East Theatre of Operations, 6 October 1942, 7-19; Elmer E. Adler, Interview by Intelligence Services, AAF, 18 Jan 1943, 7.

¹⁹³ Elmer E. Adler, Interview by Intelligence Services, AAF, 18 Jan 1943, 7; History of the 324 Fighter Group; Rogers, *The USAAF in the Middle East*, 113.

The medium bombers of the 12th Bombardment Group utilized different techniques that allowed them to maintain close proximity to the advanced depot groups. This immediacy was necessitated by three primary considerations. First, the 323d had detached a great deal of their strength forward with the 66th Fighter Squadron, and to a lesser degree the 57th Fighter Group. The 323d lacked the physical capability to dispatch further assets to the 12th Bombardment Group. The second circumstance, the greater range and speed of medium bombers, helped alleviate these circumstances by minimizing mobility requirements and allowing ground crews time to set up facilities for maintenance and supply. In addition to the logistics issues, bomber forces were both a high-priority German target and suffered from a lack of crew and aircraft replacements. Unfortunately for the 9th AF, medium bombers greater range made them a priority of for the 12th Air Force and the associated Torch landing forces.

The combination of force protection and logistical concerns forced the 12th Bombardment Group to utilize a combination of forward-based refueling and arming airfields and consolidated overnight basing and maintenance further from the front – and, importantly, out of German bombing range. Sgt Raymond L. Hall, of the 81st Squadron, 12th Bombardment Group, provided a typical example:

We were at an advanced airstrip only 18 miles from the front when it happened. Our Squadron was giving air support to the Americans and British who were giving the Germans the final boot out of North Africa. I was a member of a forward party whose detail was to maintain a camp at this forward base while our planes came up every morning from a rear base to bomb and refuel. This forward base was too close to the lines to leave our planes here overnight.¹⁹⁴

¹⁹⁴ Raymond L. Hall, “The first time I saw “Jerry” it was in the Spring,” *World War II Combat Operations Report, 1941-1945*, 12th Bomb Group to 12th Bomb Group, Box 98, Textual Reference, NM-6, entry 7, National Archives at College Park.

This highly mobile, highly unconventional method of operations also spurred numerous adaptive practices. Forced into a hostile environment with limited resources, the men of the Desert Air Task Force quickly learned from mistakes and adapted new methods to increase operational effectiveness. For instance, at the start of the campaign pilots would line their aircraft up beside the makeshift runways, emulating the order of stateside bases.¹⁹⁵ By March of 1943, that practice had evolved to not only randomly dispersing aircraft throughout the area but included wrapping mattress covers over canopies to keep moonlight from reflecting off glass. Similarly, the white stars on the wing tips were highly visible, so Airmen would cover them with blankets or barracks bags.¹⁹⁶ This ingenuity extended to mobility, where farm boys would hotwire German trucks to replace losses during squadron movements.¹⁹⁷

Despite all the adaptation and individual ingenuity demonstrated at the squadron level, the proximity of the 323d Service Group remained critical to both fighter and bomber groups mission capability and operational reach. The commencement of Operation Buster was preceded by the 323d's move to Landing Ground 174 near the Egyptian town of Amiriya, taking everything not on detached duty. Over a span of 2 weeks, the 323d managed to transport by ground everything assigned to Rayak, establishing a new forward supply depot and maintenance area to support those leading

¹⁹⁵ Brereton, *The Brereton Diaries*, 138.

¹⁹⁶ "Desert Campaign: The Story of the 9th U.S. Army Air Force in Support of the British in North Africa," 9, Microfiche 35105, AFHRA

¹⁹⁷ *The Falcon: Combat History of the 79th Fighter Group, United States Army Air Forces, 1942-1945*, 243-4.

the drive to Tripoli.¹⁹⁸ They would again move to Gambut, Libya, and from there to Bengazi, Libya.¹⁹⁹

¹⁹⁸ *Operational History, 323d Service Group*, 9 November 1943, p2, Microfiche B0840, AFHRA Archives.

¹⁹⁹ The move to Gambut was the Service of Supply's first foray into providing transportation, providing nearly ½ of the transportation, *Operational History, 323d Service Group*, 9 November 1943, 6, 8; *Memorandum from IX Air Service Command, Subject: Movement Orders*, 3 February 1943, Microfiche B5587, AFHRA Archives. Air transport would also play an increasingly important role. Air transport initially consisted of 100 cargo aircraft under Royal Air Force control stationed along the Alexandria road; when this proved too little, the Royal Air Force went to the Americans for more. The Americans responded by diverting the 316th Troop Carrier Group from its intended delivery to support the Soviets in the Caucasus. Although these resources were shared between the British and American Air and Ground forces, by the February of 1943, ½ of all advanced depot supplies were transported were by air, Kenn Rust, *The 9th Air Force in World War II*, 22. Elmer E. Adler, Interview by Intelligence Services, AAF, 18 Jan 1943, document, CARL, 7; "Desert Campaign: The Story of the 9th U.S. Army Air Force in Support of the British in North Africa," p. 4, Microfiche 35105, AFHRA.



Figure 5. Mission brief in the Northwest African desert.

Source: 9th Combat Camera Unit, United States Army, Photographs of the Allies and Axis, 1942-1945, AEF Africa (N.), Air-9th Air Force, National Archives at College Park.

Conclusion

The limitations imposed by distance and mobility, combined with the lack of consistent SOS support created consistent DOMF shortfalls during the 9th AF's march across Northwest Africa. These limitations were further stressed by USAAF doctrine's unsuitability for truly mobile operations. For instance, while the 1943 FM 1-5's emphasis on unit versus air base logistics organizations provided an organizational construct for mobile operations, it was undermined by an insistence that air ops could operate within a wide range and at decisive points. While possibly true of the multi-engine bomber fleets,

the fighter-bombers of the Desert Air Task Force had to consistently relocate to stay within operational reach.

The constant mobility required to maintain operational reach drove several DOMF capability gaps. Organizationally, the 9th AF continued to suffer from a lack of SOS forces in Northwest Africa and its attendant effects on transportation and base services. Moreover, those organizations assigned to tactical aviation did not have the personnel strength required to support mobile operations and the additional tasks it entailed. Materially, the Desert Air Task Force suffered from a shortage of the vehicles and the parts necessary to sustain constant combat operations. Finally, a constantly shifting front line and the paucity of regional infrastructure led to a near absence of aerodrome.

Despite these limitations, the IX ASC was able to develop an innovative plan for leveraging the 323d Service Groups core competencies, namely transportation, maintenance, and supply, to develop new methods of operations. These methods were still limited by capacity-the 323d could only spread itself so thin-but by removing the base service burden and augmenting maintenance teams at the squadron level, the IX ASC laid the groundwork to transform operations during Operation Buster.

Furthermore, the “leapfrog” technique prescribed by Operation Buster met all of the hallmarks of generative innovation. First, it was a proactive approach to the difficulties of maintaining operational reach during a highly mobile war, with orders for Operation Buster issued a full week prior to the British breakout along the Al Alamein line. Furthermore, the solutions were spread across the organization. The IX ASC balanced the resources against competing needs ranging from Gura to the 66th Fighter

Squadron and the point of the spear. In each case, units were cross-leveled and balanced to provided interlaced support across the DOTMLPF spectrum.

There were elements of adaptation braided into the operations; however, they were mostly at the lower levels. The willingness to embrace new methods of logistics at the squadron and higher levels trickled down into a permissive environment for adaptation at the lower levels. From the creation of airfields out of the desert to the “requisitioning” of Jerry vehicles, the Desert Air Task Force’s culture embraced the goal of mission accomplishment by any means and unleashed the ingenuity inherent in a generative organization.

In doing so, this network of interwoven innovation and adaptation that enabled the Desert Air Task Force’s race across the Northwest African desert accomplished Grissom’s requirements for operational effectiveness. Despite a lack of resources or a doctrine that embraced mobile, air-centric tactical warfare, the Desert Air Task Force was able to make its presence felt on the battlefield. That the combat forces were able to maintain an impressive 75 percent mission capable rate stands as proof; however, even more impressive was their percentage of combat missions—ranging from 10 to 50 percent on any given day of the campaign and making their presence known in the fight against the Axis.

CHAPTER 5

CONCLUSION

This paper opens with the question of how 9th AF tactical aviation, despite its humble beginnings, grew into the operationally effective instrument it was by the time it entered Tunisia. Specifically, was the 9th AF a reactive or proactive learning organization? To fully answer this question, a number of secondary resource questions were posed, namely:

1. What is a learning organization?
2. How does one examine a learning organization?
3. What effect did USAAF pre-war culture and initiatives have on the 9th AF?
4. What factors drove 9th AF change in Northwest Africa?

These secondary questions provide a contextual basis to review the primary research question that underscores this paper's hypothesis

Research Questions

What is a learning organization?

The primary research question of this paper seeks to characterize whether 9th AF tactical aviation logistics is a reactive or proactive learning organization. The core of this dilemma resides in the secondary research question: "what is a learning organization?" This paper utilizes Senge's definition, an "organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are

continually learning to see the whole together.”²⁰⁰ Deconstructed and applied within a military construct, a learning organization is a unit that attempts to increase capabilities to meet operational requirements, where new ideas are embraced, and where members constantly attempt to grasp second and third order effects.

How does one examine a learning organization?

The examination of learning culture requires a systems framework to identify choices and a theoretical framework to classify those choices. The systems framework used in this paper is DOTMLPF, a holistic evaluation model intended to identify capability gaps and solutions. The separate elements of Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities are viewed both independently and in relationship with each other. While the case studies primarily view logistical changes from the Doctrine, Organization, Materiel, and Facility (DOMF) standpoint, the inherent interdependence of DOTMLPF incorporates the other elements (training, personnel, etc.) within the limited viewpoint. The capability gaps and solutions identified in DOTMLPF are then applied against a theoretical framework that combines Senge’s concepts of adaptive and generative organizations with military social scientists’ application of learning theory.

The idea of adaptive and generative organizations pervades the unified learning theory used in this paper. Keeping within the context of what a learning organization is, the adaptive and generative concepts clarify how a learning organization “expand[s] their

²⁰⁰ Senge, 3.

capacity.”²⁰¹ Essentially, adaptive organizations expand their capacity in reaction to immediate stimuli, while generative organizations proactively attack future issues.

The reactive/generative organizational construct is then applied against Williamson Murray’s theories on adaptation and innovation, transmuting the simplistic definition of peacetime innovation and wartime adaptation to a more nuanced concept of enemy action and reaction. Within this construct, adaptation describes a learning organization’s change in response to direct enemy stimuli. The enemy sets the timeline, controlling the pace and requirements of change. Innovation, on the other hand, is independent of the enemy. While capability gaps may result from enemy action, the pace of change is not determined by the enemy, allowing a more measured, holistic approach.

Having defined adaptation and innovation, these concepts are then integrated with Theo Farrell’s description of how military learning organizations change. Farrell argues that military organizations can either “exploit core competencies,” customizing current capabilities to overcome a capability gap, or “explore new capacities,” by developing entirely new methods of using core competencies.²⁰² The former is indicative of adaptive change, while the latter typifies innovation.

Finally, adaptation and innovation must work towards a purpose, demarcating between inept bumbling and a purposeful movement to change. Adam Grissom classifies this delineation through a three-part test to determine based on operational effectiveness. Grissom argues that change alone does not define a learning organization, change must

²⁰¹ Ibid., 3.

²⁰² Farrell, 570.

have a substantial effect on both operations and military effectiveness. In doing so, Grissom directly aligns with the DOTMLPF framework of bridging capability gaps, as well as Senge's charge to "expand capacity to create results they truly desire."²⁰³

What effect did USAAF pre-war culture and initiatives have on the 9th AF?

As discussed in chapter 2, a combination of political, technological, and intra-service developments shaped the USAAF's pre-war culture. On the political front, strong non-interventionist sentiment limited operational concerns to homeland defense. This philosophy gave rise to the mission of active defense, which advocated launching long-range missions from coastal bases to neutralize threats before they could threaten the continental United States. Developments in aviation technological further reinforced this mission, with the invention of multi-engine bombers and the inherent increases in speed and bombload dovetailing nicely with the active defense mission.

The rise in bombers suited for active defense saw a corresponding fall in the importance of other missions. The maneuverable single engine fighters which comprised the pursuit forces lacked bombers speed and distance, and were relegated to immediate coastal defense while formations of bombers saw to their own defense. In the arena of attack, the allure of speed and firepower overcame requirements for maneuverability, limiting USAAF's ability to perform close air support and shifting the focus to lines of communication interdiction.

²⁰³ Senge, 3.

The primacy of multi-engine bombers facilitated an air base-centric logistics arrangement specific to Army force structure and the industrial infrastructure of the United States. Multi-engine bombers greater operational reach and the homeland defense mission encouraged large air bases logistically supported by habitually aligned SOS forces. The possibility of overseas bases was considered; however, only within the purview of strategic bombing, which would enable the same fixed base infrastructure.

Perhaps most importantly, the advent of bomber warfare and limited interwar budgets drove home an air centric command and control philosophy that often clashed with the rest of the Army. The USAAF firmly believed airpower must remain centralized to achieve its strategic effect. Decentralizing command authority to ground commander only undermined its flexibility and diluted its effectiveness. This fight for increased autonomy bled over into budget struggles, where the USAAF competed with ground forces for materiel, personnel, and facilities.

Despite a settled strategic bombing culture that eschewed tactical aviation and its logistical requirements, the continual ideological struggle with ground forces and an increasing likelihood of war drove pre-war innovation that would shape 9th AF tactical aviation logistics. With war on the horizon, the USAAF was assigned to support General Headquarters Maneuvers in Louisiana and the Carolinas. Contributing over a 1,000 aircraft to this effort, these exercises forced the USAAF to rethink service and supply and led to the formation of Service and Air Depot Groups. Additionally, the British Lend-Lease mission in the Middle East established a basic logistical infrastructure for combat operations. Innovative measures such as contracted in-theater maintenance schools, aircraft depots, and even the construction of a port would pay dividends in the future.

Moreover, the USAAF showed a willingness to learn from British operations, establishing procedures for contractors to relay desert maintenance and combat-tested flight characteristics to the manufacturer for inclusion in future models

The combination of pre-war culture and innovations shaped the 9th AF capabilities in Northwest Africa. Reflecting flaws in the active defense base structure and its dependence on American ground forces, the 9th AF lacked the SOS forces necessary to maintain theater supply depots, lines of communications, or even base services such as food and laundry. Additionally, the preoccupation with an air base-centric method of support meant that the USAAF lacked an established organizational construct to fill this gap, or, when the British offensive began, to support mobile operations.

Fortunately, British Lend-Lease infrastructure and innovations such as provisional Service Groups, and eventually, Air Depot Groups, were available. While neither fully organized, nor equipped, for the roles they would eventually fill, Service Groups provided vital service and supply capabilities in the absence of the SOS. Equally important, mechanics trained on American aircraft, a commonality of parts, and facilities such as Gura air depot and its attached port provided the 9 AF with a vital logistics lifeline and form the basis for future adaptation and innovation.

What factors drove 9th AF change in Northwest Africa?

In a generic sense, the DOTMLPF gap between current capabilities and required capabilities drove 9th AF changes. This gap was a product of the both the pre-war culture and innovation outlined above and the 9th AF's operational environment. Within the operational environment itself, German success and failure, as well as simple geography played the largest roles. German success forced the lopsided force distribution caused by

rushing American forces into theater. Later, German failure would launch a mad dash across the desert in a high mobility chase to maintain operational reach. Similarly, the vastness of the desert and lack of established airfields would drive changes in base services, lines of communications, supply, and basing.

Was the 9th AF a reactive or proactive learning organization?

Despite capability gaps throughout the tactical aviation logistics enterprise, the 9th AF achieved operational success through proactive change, skillfully leveraging its units' core capabilities and the evolving logistical structure established by the USAAF between 1941 and June 1942. Examples of proactive, innovative change were evident in the establishment of theater logistics capabilities during the early months of the 9th AF's existence and the "leapfrog" logistics of Operation Buster.

The first, theater logistics, demonstrated proactive support through its focus on future operations versus current requirements. Rather than assume a purely reactionary logistics arrangement by consolidating American around supply centers, the 9th AF chose to concentrate on building future capability. The 9th AF accomplished this by utilizing the 323d Service Group's transportation and quartermaster core competencies in new ways. The Service Group's intended mission was to provide parts and 3/4th level maintenance for two aviation combat groups. Under the 9th AF's innovative approach to logistics, the 323d's actual mission became boosting the Gura depot's capacity, strengthening lines of communication, and establishing an advanced depot in Palestine.

Operation Buster was the second major example of proactive change. Demonstrating its capacity as a learning organization, the 9th AF presented a whole of organization solution to supporting operational mobility across North Africa. The 9th AF

once again leveraged the 323d Service Group's core competencies of transportation, maintenance, and supply to develop new methods of operations, releasing the 323d from theater obligations and assigning base service and maintenance teams to forward squadrons. Moreover, the "leapfrog" technique was characteristic of generative innovation. By exercising a proactive approach to maintaining operational reach, the 9th AF was able to balance the DOTMLPF gap using resources throughout the organization. In this way, 9th AF tactical aviation logistics was able to meet a competing range of requirements spanning from Gura in Eritrea to the 66th Fighter Squadron just miles behind the front.

The prevalence of proactive innovation does not imply an absence of reactive adaptation. After all, the 57th Fighter and 12th Bombardment Group's initial beddown exemplified reactive adaption. The immediate deployment of two tactical aviation units without the ground elements or a support infrastructure was a direct result of enemy success in North Africa. Simply put, the tactical aviation found itself responding to German initiative. Furthermore, the decision to utilize British organization, materiel, and facilities to bridge the DOTMLPF gap demonstrated the adaptation of existing processes for new purposes.

In the case of tactical aviation beddown, the existence of reactive adaptation actually highlights the overall proactive state of the 9th AF as a learning organization. In the case of tactical aviation beddown, the assimilation of American into the Royal Air Force was accomplished to maximize resources for proactive purposes. The 323d Service Group arrived within 2 weeks of the 57th Fighter and 12th Bombardment Group. As shown later in the campaign during Operation Buster, 9th AF could have dispersed its

personnel to individual squadrons to enable American operations under a doctrinally approved American task force. When faced with the decision, the 9th AF chose to be a proactive, innovative organization.

Applicability to Modern Operations: Adaptive Basing

The 9th AF's choice to innovate for the future challenges versus adaptation in the face of an unpleasant reality parallels and illuminates the choice modern strategists face in the realm of adaptive basing. Defined as "an enterprise-level approach to USAF [United States Air Force] force development and operational employment that ensures Air Force capability to project power into and fight from forward bases in contested environments," adaptive basing explores the transition of air bases from the unlimited operational freedom of Cold War "fortress bases" with an at-risk, operationally constrained environment.

Today's operational environment is driving a new requirement, where "bases are fighting positions, not sanctuaries."²⁰⁴ The "fortress base," ideal of large, well-protected sanctuary bases from which America can project global power is a thing of the past. Non-traditional threats, such as cyber and surface based weapon systems ranging over 1,500 miles, has placed America's traditionally safe bases in harm's way.²⁰⁵ To use modern

²⁰⁴ Mark Svetska, interview by author, 11 April 2017.

²⁰⁵ Christopher J. Bowie, *The Anti-Access Threat and Theater Air Bases* (Washington, DC: Center for Strategic and Budgetary Assessments, 2002), vi, accessed 28 April 2017, <http://csbaonline.org/research/publications/the-anti-access-threat-and-theater-air-bases>; Robert D. Davis, "Forward Arming and Refueling Points for Fighter Aircraft: Power Projection in an Antiaccess Environment," *Air and Space Power Journal* (September-October 2015): 9, accessed 28 April 2017, <http://www.au.af.mil/au/afri/aspj/digital/pdf/articles/2014-Sep-Oct/F-Davis.pdf>.

terminology, the current American basing footprint already extends into adversaries' anti-access, area denial zone.²⁰⁶

In many ways, the situation the USAF faces today is analogous with the 9th AF's in 1942, offering numerous lesson learned. The benefits of host nation support, the need for mobile logistics to support resilient basing is applicable to modern warfighters. True, the exact character of each situation is different, but the nature of operations remains unchanged.

For instance, when the 9th AF arrived in the Middle East, they were limited by priorities, air-supply, and facilities. To a large degree, their answer to this dilemma was to leverage British infrastructure and capabilities. This is no different from modern warfare, where quick reaction forces face constrained air mobility and limited overseas infrastructure. Fortunately for the 9th AF, tactical aviation units were able to fall in on common-use parts and American-trained mechanics. Modern forces would do well to heed these lessons, investing in forward deployed equipment storage and working with the State Department to encourage foreign military training.²⁰⁷ Foreign military sales is equally relevant. In 1942, Lend-Lease was the impetus behind aircraft and maintenance interoperability. In today's world, inclusion in the international F-35 Joint Strike Fighter

²⁰⁶ Joint Chiefs of Staff, Joint Publication 1-02, *DOD Dictionary of Military and Associated Terms* (Washington, DC: Government Printing Office, March 2017), 17-8, accessed 1 May 2017, http://www.dtic.mil/doctrine/new_pubs/dictionary.pdf.

²⁰⁷ Per the Foreign Assistance Act of 1961, foreign military training falls under the purview of the United States Department of State rather than the Department of Defense, "Foreign Military Training and DoD Engagement Activities of Interest," United States Department of State, accessed 1 May 2017, <https://www.state.gov/t/pm/rls/rpt/fmtrpt/>.

program and sales of F-16 tactical aircraft to strategically placed partner nations can have the same effect. Of course, while host nation partners can enable logistics, that is not the same as replacing organic logistics.

If one was forced to describe 9th AF logistics in a single word, it would be mobile. 9th AF tactical aviation logistics was self-transportable and self-sustainable, allowing units to minimize their at-risk footprint while maintaining operational reach. In the case of the 66th Fighter Squadron, leapfrogging from one squadron-sized airfield to another ensured proximity to the battlefield and denied the enemy a long-standing static target. The 12th Bombardment Group utilized a different model, establishing multiple forward arming and refueling points to increase operational reach while confining the majority of logistical resources in more defensible positions further behind friendly lines. The common factor in both situations was the ability of mobile logistics to establish forward locations capable of refueling, repairing, and rearming aircraft.

The 66th Fighter Squadron and 12th Bombardment Groups logistical innovation is tantalizingly familiar to modern logisticians. Recent initiatives such as the Pacific Rapid Raptor exercises seek to enable a forward arming and refueling capability using C-17 transports and forward bases.²⁰⁸ Likewise, a recent senior leader perspective paper advocated untethered basing, where a single C-17 would rotate between Eastern

²⁰⁸ David A. Williamson, "Pacific Air Forces' Power Projection: Sustaining Peace, Prosperity, and Freedom," *Air and Space Power Journal* (January-February 2015): 58-9, accessed 1 May 2017, <http://www.au.af.mil/au/afri/aspj/digital/pdf/articles/2015-Jan-Feb/V-Williamson.pdf>.

European airfield, standing up short-term rearming and refueling points for fighter aircraft.²⁰⁹

In fact, the very similarity between Rapid Raptor, untethered basing, and 9th AF experiences in Northwest Africa signal the historical possibilities for guiding future actions. For instance, while modern efforts revolve around air mobility, lessons from 1942 argue against restricting logistics to air centric mobility. The very centralized command concepts that enhance airpower also risk mobility aircraft's reprioritization to other missions. In Northwest Africa, theater requirements such as the Torch landings, and regional requirements such as the British 8th Army diverted air assets from the 9th AF. In the current joint and multinational environment, forward units face equal or greater risks that mobility assets will be reprioritized.²¹⁰ Additionally, air mobility assumes local air superiority, which will not always be the case. In response, modern logistics forces must regain self-transport capabilities.

These are just some of the convergences between 9th AF tactical logistics and contemporary adaptive basing. There are numerous other affinities beyond the breadth and depth of this paper's purview. Topics such as ability to withstand attrition, soft

²⁰⁹ Charles Q. Brown, Bradley D. Spacey, and Charles G. Glover, "Untethered Operations: Rapid Mobility and Forward Basing Are Keys to Airpower's Success in the Antiaccess/Area-Denial Environment," *Air and Space Power Journal* (May-June 2015): 17-25, accessed 1 May 2017, http://www.au.af.mil/au/afri/asbj/digital/pdf/articles/2015-May-Jun/SLP-Brown_Spacey_Glover.pdf.

²¹⁰ *Hearing before the Senate Committee on Armed Services*, United States Transportation Command, 115th Cong., 1st Sess., May 2 2017, accessed 4 May 2017, <https://www.armed-services.senate.gov/hearings/17-05-02-united-states-transportation-command>; Katla Vlachos-Dengler, "Carry That Weight: Improving European Strategic Airlift Capabilities" (doctoral thesis, Pardee RAND Graduate School, 2007), 16-19, accessed 1 May 2017, http://www.rand.org/pubs/rgs_dissertations/RGSD219.html.

airfield use and combat repair, base defense, convoy protection, and mobile maintenance support all show promise in guiding present-day strategists; however, in the interests of brevity must be left for a future author.

Recommendations for Future Research

Modern adaptive basing concepts are not the only avenues for future research. This paper only touched upon the 9th AF's efforts from June 1942 to June 1943. While this is an under-researched period during which significant changes were occurring in tactical aviation logistics, it was not the only such period. The 9th AF's actions during Operation HUSKY (the invasion of Sicily in 1943) was another fertile logistical period. An extension of logistical research into this period would present an important continuation to the theme of logistical innovation.

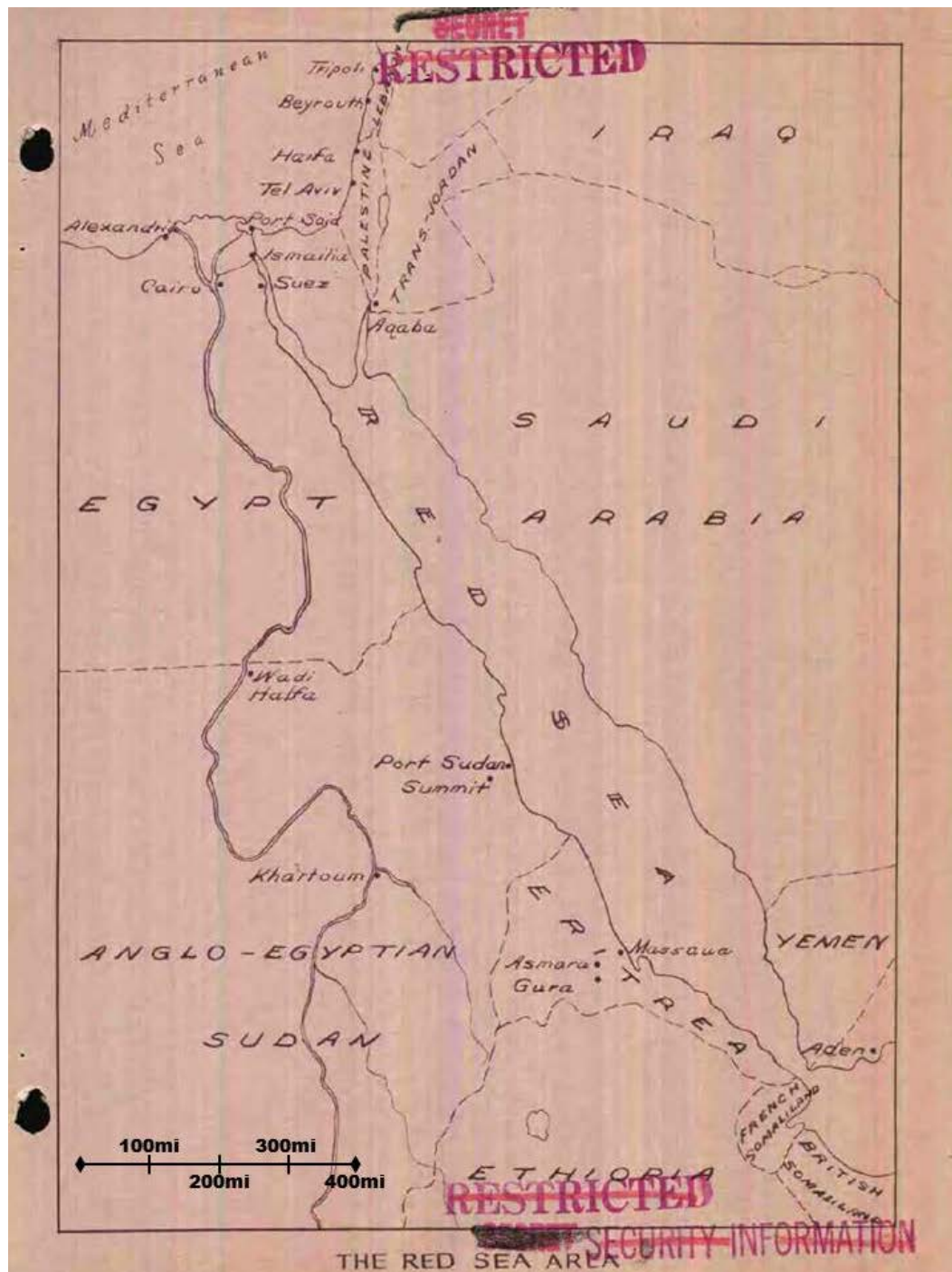
Additionally, this paper was only concerned with the tactical level of innovation. The actions of higher headquarters were only pertinent in relation to the conditions those actions set on the ground. While a necessary restriction, this limitation provided a relatively simplistic view of innovation in the USAAF. The relatively small size of the pre-war USAAF and the implications of pre-war experimentation and investment in the Middle East implies that a total force learning organization existed at that time. Further research into the relationship between the 9th Force and USAAF headquarters might reveal additional lessons on organizational learning.

Finally, the 9th AF is unique amongst World War II numbered Air Forces in that it essentially shut down and restarted halfway through the war. Though much of the leadership core at higher headquarters remained intact, the move from the MTO to the European Theater of Operations provided the opportunity for leadership to step back and

recreate processes and organizations based on what they had learned in the desert. An comparison of MTO and European Theater of Operations force structures and policies could illustrate not only the numbered air force lessons learned process, but the part played by USAAF headquarters as well.

APPENDIX A

LEND-LEASE FACILITIES AND NORTH AFRICA POPULATION CENTERS



Source: Edith Rogers, USAF Historical Studies No. 108, *The UAAF in the Middle East: A Study of the Origins of the Ninth Air Force*, 22; Scale added by author.

APPENDIX B

DOTMLPF ANALYSIS: SUPPLY LINES

DOTMLPF Analysis: Supply Lines			
Category	Requirement	Gap	Adaptation/Innovation
Doctrine	<ul style="list-style-type: none"> - FM 100-5, Air task force structure for all possible requirements - USAAF FM 1-5/FM 1-195, provides aviation-specific supplies, maintenance (through Air Service Center concept) - FM 10-10/FM 10-5, SOS provides base services, non-aviation specific supplies 	<ul style="list-style-type: none"> - Lacked sufficient Air Services officers to man advanced headquarters, advanced depot/service center, main headquarters, and Gura/Abaddan depot requirements - Shortage of aviation-specific supplies - SOS personnel not available 	No doctrinal changes at 9th AF level
Organization	<ul style="list-style-type: none"> - Pre-positioned SOS forward supply depots or Army ground forces supply centers - SOS theater supply depots - SOS-supported lines of communication - Air Service Center 	<ul style="list-style-type: none"> - No SOS forward depots or Army ground forces - No SOS transportation/quartermaster units for use on lines of communication - Air service center doctrine unknown/not formed in theater 	<ul style="list-style-type: none"> - Direct 323d Service Group to stand up advanced depot at Rayak, Syria - Direct 323d Service Group to transfer quartermaster company to Gura depot - Utilize 323d Service Group transportation companies for lines of communication between Rayak/Gura - Utilize tactical aviation group ground elements to provide transportation between advance depot in Rayak/forward units
Training	<ul style="list-style-type: none"> - Convoy training - Depot quartermaster training 	<ul style="list-style-type: none"> - Minimal convoy training (323d Service Group transportation companies), none in non-transportation companies - Minimal supply/services training (323d Service Group quartermaster companies), none in non-quartermaster companies 	<ul style="list-style-type: none"> - Utilize 323d Service Group transportation for long-distance trips - Utilize non-transportation units for travel between advanced depot/combat units (On-the-job training/acceptance of risk)

Category	Requirement	Gap	Adaptation/Innovation
Materiel	<ul style="list-style-type: none"> - Parts/tools for one fighter group/one medium bombardment group - All classes of supplies for same - Transportation assets 	<ul style="list-style-type: none"> - Insufficient parts available (only spare parts which could be flown in during initial ferry operation) - One partial tool set per squadron in medium bombardment group/none in fighter group - Minimal American supplies available due to limited capacity at Gura 	<ul style="list-style-type: none"> - British lend-lease parts - British tool sets/mechanics - British lend-lease trucks - Build up supplies at advanced depot before switching to American supply chain - Build up Gura capacity to support additional throughput as US builds industrial production
Leadership and Education	<ul style="list-style-type: none"> - SOS commander for theater depot, port facilities 	<ul style="list-style-type: none"> - No SOS commander available for Gura/Massawa 	<ul style="list-style-type: none"> - USAAF officer assigned to command Gura depot
Personnel	<ul style="list-style-type: none"> - Sufficient SOS personnel to man theater depot, convoys along lines of communication - 1,500-2,500 personnel for Air Service Center 	<ul style="list-style-type: none"> - No SOS personnel (outside of minimal staff presence) in theater - Only 1,200 personnel assigned to 323d Service Group 	<ul style="list-style-type: none"> - Utilize USAAF/British Royal Air Forces (see other categories)
Facilities	<ul style="list-style-type: none"> - Theater depot - Port in proximity to combat operations (or train access to advanced depot) - Forward supply depots - Air Service Center 	<ul style="list-style-type: none"> - Gura (theater depot) not running at full capacity - Gura/Massawa over 1,400 miles from combat units - Air Service Center not formed 	<ul style="list-style-type: none"> - Build up Gura capacity to support additional throughput as US builds industrial production (utilizing additional manpower from 323d Service Group) - Build advanced depot at Rayak to support forward units - Utilize British maintenance capability in lieu of Air Service Center

APPENDIX C

DOTMLPF ANALYSIS: TACTICAL AVIATION BEDDOWN/OPERATIONS

DOTMLPF Analysis - Tactical Aviation Beddown/Operations			
Category	Requirement	Gap	Adaptation/Innovation
Doctrine	<ul style="list-style-type: none"> - FM 100-5, Air task force structure for all possible requirements - USAAF FM 1-5/FM 1-195, provides aviation-specific supplies, maintenance - FM 10-10/FM 10-5, SOS provides base services, non-aviation specific supplies 	<ul style="list-style-type: none"> - No air task force structure for tactical aviation units - Ground elements arrived after aircraft/aircrews - SOS personnel not available 	No doctrinal changes at 9th AF level
Organization	<ul style="list-style-type: none"> - Air task force - SOS base service units - Squadron ground elements for 1st/2d level maintenance/Air Service Center for 3d level maintenance - SOS supply lines of communication with forward depot 	<ul style="list-style-type: none"> - No air task force for tactical aviation units - No SOS base or transportation units - Squadron ground elements arrived 2 weeks after the air elements 	<ul style="list-style-type: none"> - Assimilate tactical aviation into British Western Desert Air Force (with intentions of forming USAAF air task force soon) - Utilize British unit capabilities, with USAAF augmentation once ground elements arrive
Training	<ul style="list-style-type: none"> - Convoy training - Quartermaster training for base service elements 	<ul style="list-style-type: none"> - No convoy or quartermaster-trained personnel assigned to tactical aviation units 	<ul style="list-style-type: none"> - OJT provided by British - British supply officers oversee/route USAAF supply requests (min training requirements)
Materiel	<ul style="list-style-type: none"> - Squadron tool sets - Parts/tools for one fighter ground/one medium bombardment group - All classes of supplies for same 	<ul style="list-style-type: none"> - Insufficient parts available (only spare parts which could be flown in during initial ferry operation) - One partial tool set per squadron in medium bombardment group/none in fighter group - Limited access to American supply chain (only after Rayak advance depot stands up) 	<ul style="list-style-type: none"> - Utilize British tool sets/parts (commonality due to lend-lease and American school at Ismailia)

Category	Requirement	Gap	Adaptation/Innovation
Leadership and Education	N/A	N/A	N/A
Personnel	<ul style="list-style-type: none"> - SOS personnel to man base service elements, forward depots, transport between same - Squadron ground elements - 1,500-2,500 personnel for Air Service Center 	<ul style="list-style-type: none"> - No SOS personnel (outside of minimal staff presence) in theater - Squadron ground elements arrived 2 weeks after the air elements 	<ul style="list-style-type: none"> - Leverage British personnel in theater, augmented by ground elements upon arrival
Facilities	<ul style="list-style-type: none"> - Personnel beddown facilities - Ramp space - Maintenance bays/hangers - Base service element facilities 	<ul style="list-style-type: none"> - Limited excess maintenance/service facilities available for American units - Limited ramp space - Limited beddown facilities 	<ul style="list-style-type: none"> - Utilize British facilities/ramps - Transfer 65th Fighter Squadron to Cyprus pending breakout

APPENDIX D

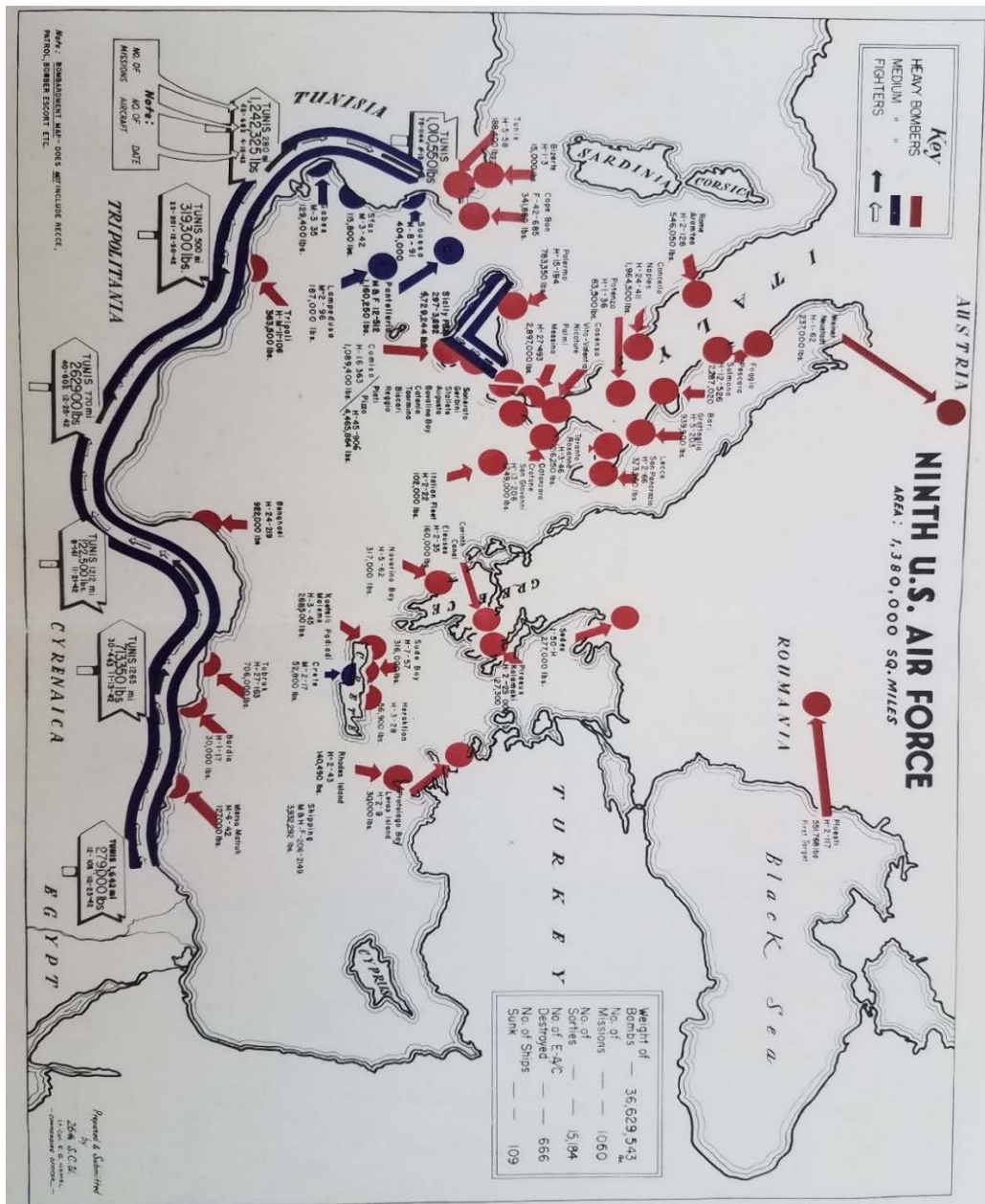
DOTMLPF ANALYSIS: DESERT AIR TASK FORCE SUPPORT DURING THE RACE ACROSS NORTHWEST AFRICA

DOTMLPF Analysis - Desert Air Task Force Support during the Race Across Northwest Africa			
Category	Requirement	Gap	Adaptation/Innovation
Doctrine	<ul style="list-style-type: none"> - FM 100-5, Air task force structure for all possible requirements - FM 1-5, Air ops at any point within a wide area, without moving bases <i>and</i> action at decisive points - USAAF FM 1-5/FM 1-195, combined SOS/USAAF service unit provides supplies, maintenance 	<ul style="list-style-type: none"> - No air task force for tactical aviation forces - Despite air mobility, tactical air ops lacked operational reach to affect decisive points - Lack of SOS personnel in theater, minimal SOS personnel included in Service Group 	N/A
Organization	<ul style="list-style-type: none"> - Pre-positioned SOS forward supply depots or Army ground forces supply centers - SOS theater supply depots - SOS-supported lines of communication - Ground elements for 1/2d level maintenance - Combined SOS/USAAF service unit for 3/4th level maintenance, base services 	<ul style="list-style-type: none"> - No SOS forward depots or Army ground forces - No SOS transportation/quartermaster units for use on lines of communication - Lack of ground elements to form Force A/B units - USAAF Service Group currently providing LOC, Gura Depot, advanced depot support 	<ul style="list-style-type: none"> - Return Gura detachment to 323d Service Group - Form base service detachments from 323d Quartermaster units - Transfer mobile aircraft/truck repair teams to forward units (focus on 66th Fighter Sq) - 323d Service Group provides forward depot/3/4th level maintenance to 57th Fighter/12th Bomb Group
Training	<ul style="list-style-type: none"> - Base service/quartermaster training - Convoy training 	<ul style="list-style-type: none"> - Combat squadrons minimal convoy training (only ground elements performing supply duties) 	None

Category	Requirement	Gap	Adaptation/Innovation
Materiel	<ul style="list-style-type: none"> - Aviation-specific parts/supplies - Aircraft - All other classes of supply (including fuel) - Transportation assets 	<ul style="list-style-type: none"> - Minimal aircraft parts/aircraft through Dec '42 - No replacements for truck attrition 	<ul style="list-style-type: none"> - Cannibalization of aircraft parts - Rotate replacement unit aircraft into front lines - Utilize captured trucks - Designate 66th Fighter Sq as highest priority, cannibalize other squadrons to ensure Mission Readiness
Leadership and Education	<ul style="list-style-type: none"> - Air task force structure 	<ul style="list-style-type: none"> - No Air task force for tactical aviation units 	<ul style="list-style-type: none"> - Form Desert Air Task Force, place under Western Desert Air Force

APPENDIX E

OPERATION BUSTER AND THE DRIVE ACROSS NORTH AFRICA (REFERENCE SIGNPOSTS ON BOTTOM OF MAP)



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